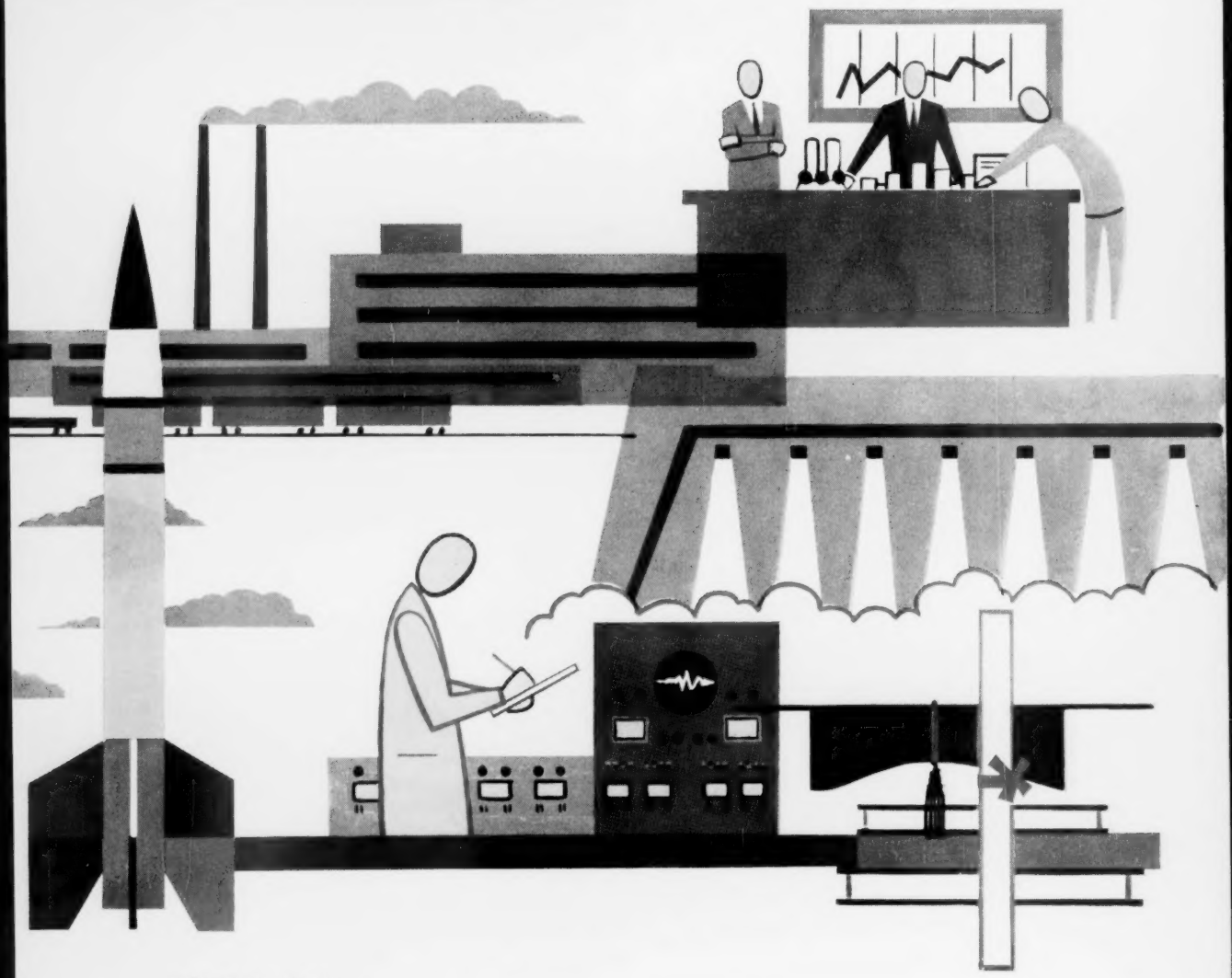
FEBRUARY, 1956

American Engineer

SPECIAL ISSUE
for
National Engineers' Week
FEBRUARY 19-25



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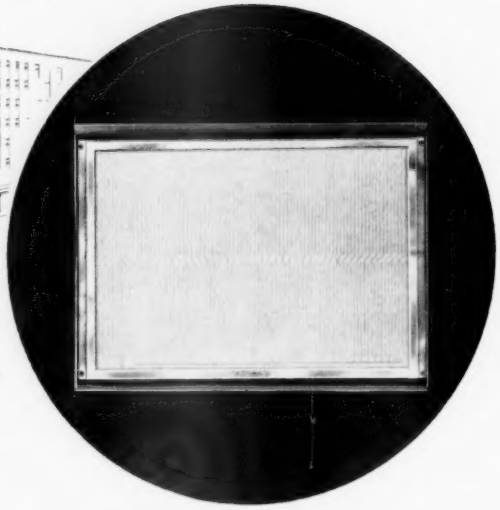

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American Engineer

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—President George Washington
First Annual Message to Congress, January 8, 1790.

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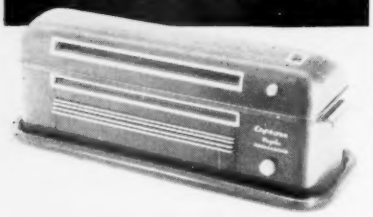

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Letters

The Dow Story . . .

Dear Editor:

. . . In this Department we have been groping for a plan to accomplish what the people of the Dow Chemical Company have accomplished. Of particular importance is that the individual engineer is given professional recognition. By being registered and sealing his own work, job interest and performance is certain to be improved . . . .

V. E. GRIMM, JR., P.E.,
Department of Engineering,
City of Miami, Fla.

Dear Editor:

The Eastern Chapter of the Nebraska SPE has asked me to request 50 reprints of "Professionalism in Industry: The Dow Story" . . .

Our Chapter Board of Directors were very enthusiastic about this article. The January 26 meeting of our Chapter will deal with this subject, when Mr. L. O. Arstad, Assistant Vice President (Engineering), Northwestern Bell Telephone Company, will speak to us on "Making the Best Use of Engineering Talent."

FRED J. MATTHIES, P.E.,
Omaha, Neb.

Social Security Law . . .

Dear Editor:

We have read in both the legislative report and in the Annual Report that the Society is supporting a revision of the Social Security law to remove the earning restrictions at retirement. We appreciate your efforts on this matter and hope that you continue to support and work for such an amendment. Many of us approaching retirement age are unable to retire, because of these limitations. We have reared families that have cost us a great deal in our younger years and then when the dependents are removed, our income taxes have increased so that our financial status is about the same . . .

H. A. MARSHALL, P.E.,
Topeka, Kan.

Corporate Practice . . .

Dear Editor:

The Board of Directors of the Monroe Chapter, New York State SPE, by means of resolution, calls attention to a glaring weakness in the plan proposed under Professional Postscripts in your December 1955 issue by the "Committee on Engineering Laws" for the practice of engineering under a corporate business structure.

As proposed by C. E. L. in your December issue and also here in the State of New York for the last three years, it would be necessary for *only one* person in a corporation to be a licensed professional engineer. Thus, as long as there is a vice-president who is licensed it would be possible to have three or four hundred persons working under him doing engineering work and yet none of them licensed as professional engineers. That is the core of our objection to C. E. L. We here in the Monroe Chapter believe that the stand of N.Y.S.S.P.E. and

(*Continued on page 61*)

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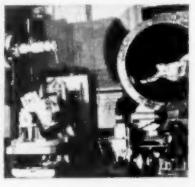

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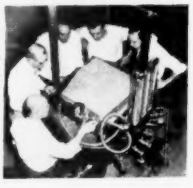

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PROFESSIONAL NEWS IN CAPSULE FORM

A Roundup of Late Events for Professional Engineers

Joseph Ehlers Takes Government Post

Joseph H. Ehlers of Washington, D. C., a well-known member of the District of Columbia SPE and NSPE, has been named assistant commissioner for technical services of the Urban Renewal Administration. The appointment was announced by Commissioner J. W. Follin; and in the new position Mr. Ehlers, as principal technical advisor, will coordinate the work of the six URA technical branches.

A consulting engineer and an attorney, Mr. Ehlers has established an outstanding record in both private practice and government service. For the past six years he has been acting as field representative for the American Society of Civil Engineers. He is now also serving as chairman of the Advisory Committee on Engineers of the U. S. Civil Service Commission.

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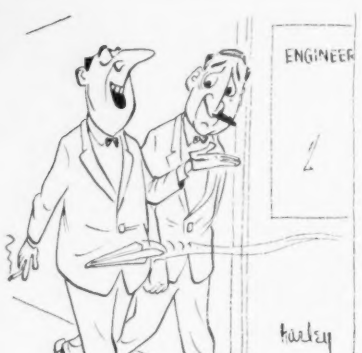
Lawlor Is Re-elected Mayor of Ames

Joseph P. Lawlor, a registered professional engineer and president of the General Filter Company of Ames, Iowa, has been elected to a second term as Mayor of the Iowa city. A member of NSPE, Mr. Lawlor has also recently been re-elected as president of The Iowa Taxpayers Association, which has headquarters in Des Moines.

Office of Education Reports 1955 Degrees

According to newly-released figures from the United States Office of Education, in 1955 some 22,589 students received bachelor's degrees in engineering, while 10,516 received degrees in the physical sciences and 4,034 graduated in mathematics.

As in 1954, the statistics show that scientists and engineers were awarded 20 per cent of the total number of all bachelor's degrees granted in the country.



". . . and here is Engineering—model of a well-run, efficient department."

Standards Association Elects New Officers

Directors of the American Standards Association have announced the election of H. Thomas Hallowell, Jr., and Van H. Leichliter as president and vice president, respectively, of the organization. Mr. Hallowell is president of the Standard Pressed Steel Company of Jenkintown, Pennsylvania. Mr. Leichliter is vice president of operations with the American Steel and Wire Division of the United States Steel Corporation in Cleveland.

Engineers' Week

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D. E. Gray Named to Science Foundation Post

The appointment of Dwight E. Gray as program director for Government Research Information in the Office of Scientific Information of the National Science Foundation has been announced by Dr. Alan T. Waterman, NSF director.

Gray, a well-known physicist, has for the past five years been chief of the Technical Information Division of the Library of Congress.

Nuclear Energy Institute Set for Argonne Lab

Under the sponsorship of the American Society for Engineering Education, the National Science Foundation, the Atomic Energy Commission, and Northwestern University, a special Nuclear Energy Institute to be conducted by and at the Argonne National Laboratory has been scheduled for eight weeks beginning June 20, 1956. The purpose of the Institute, which will be limited to sixty participants, will be to provide engineering college faculty members with the specialized information which will help them incorporate nuclear engineering material into their courses of instruction.

The Argonne Lab will provide the instruction without tuition charge. The respective colleges and universities are expected to pay their Institute participants one month's salary, and this will be matched by an equal stipend from funds provided by the National Science Foundation. Travel allowances will also be provided.

Application blanks can be obtained from the Dean, Technological Institute, Northwestern University, Evanston, Illinois, and applications must be returned by March 1 to be considered.

The courses offered during the Institute will be in the areas of chemistry, chemical engineering, metallurgy, nuclear engineering, nuclear instruments, and reactor physics.

Edison Medal Awarded to Umansky

Leonid A. Umansky, manager of engineering, Industrial Engineering Department, General Electric Company, Schenectady, New York, has recently been presented with the 1955 Edison Medal of the American Institute of Electrical Engineers.

Mr. Umansky, the forty-fifth winner of the medal, was cited "for his outstanding contribution to the electrification of industry through the application of electrical machines, devices and systems to automatic process machinery; and for his inspiration, leadership, and teaching of men in this work."

The award was presented on January 31 at a special session of the five-day Winter General Meeting of the AIEE at the Hotel Statler in New York City.

New Editor for Aeronautical Journal

Dr. William R. Sears, director of the Graduate School of Aeronautical Engineering at Cornell University, Ithaca,

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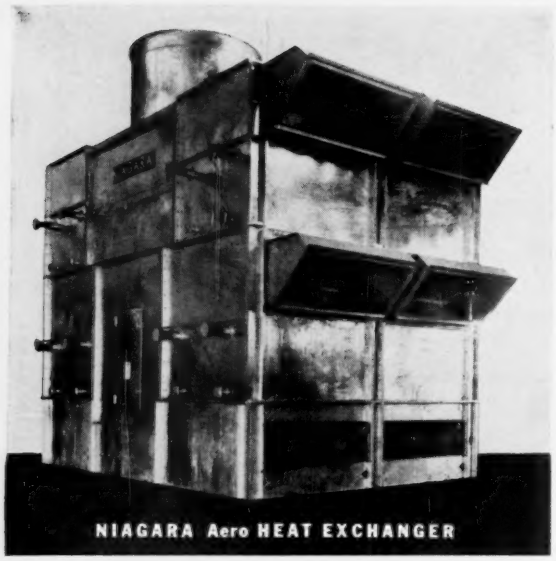

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New York, has been named editor of the *Journal of the Aeronautical Sciences*, which is published by the Institute of the Aeronautical Sciences with headquarters in New York City.

In the part-time post, Dr. Sears succeeds Dr. Hugh L. Dryden, director of the National Advisory Committee for Aeronautics, who has edited the *Journal* for the past fifteen years. Dr. Dryden asked to be relieved of the editorship because of the pressure of other work.

Canadian Court Verdict Protects P.E.'s

The December 1955 issue of the *British Columbia Professional Engineer* reports a court decision of interest to professional engineers.

In the first case prosecuted under the new Engineering Profession Act, the Vancouver Police Court, on November 29, found the Industrial Mill Service Ltd. of Vancouver guilty of violating the Act because of "advertising themselves as experts in sawmill design and plywood plant design while not registered as professional engineers." The defendants were fined twenty-five dollars for the offense.

Stever in New M.I.T. Post

Dr. H. Guyford Stever, chief scientist of the Air Force, has been appointed associate dean of the School of Engineering at the Massachusetts Institute of Technology, according to President James R. Killian, Jr. He has also been promoted from associate professor to professor of aeronautical engineering.

Dr. Stever has been on leave from M.I.T. since February, 1955, in order to serve in his Government post as advisor to the Chief of Staff and the Secretary of the Air Force. He will return to M.I.T. and take up his duties as associate dean in June.

He is a graduate of Colgate University and the California Institute of Technology.

Educational Needs Cited For Nuclear Engineers

Education for potential nuclear engineers should "emphasize breadth rather than specialization," according to a recent statement by Robert J. Fritz, a General Electric Company nuclear engineer.

Mr. Fritz, who works at the Knolls Atomic Power Laboratory, operated by G. E. for the Atomic Energy Commission, told the recent Nuclear Engineering and Science Congress in Cleveland that undergraduate education for the designer should emphasize engineering fundamentals rather than application.

"Specialization in any particular field should be reserved for the graduate program," he stated. "The undergraduate program should then be basically in mechanical engineering with a heavy emphasis on fundamentals, on mathematical tools to use with these fundamentals, and should include studies in modern physics."

1953 Research Cost Is Reported By NSF

Industrial research and development effort in the United States cost $3.7 billion in 1953 and required the employment of nearly 30 per cent of all scientists and engineers in industry, according to the results of a survey conducted by the Bureau of Labor Statistics for the National Science Foundation.

The published study, *Science and Engineering in American Industry—Preliminary Report of a Survey of Research and Development Costs and Personnel in 1953-1954*, is based on a questionnaire survey of approximately 11,600 companies chosen as representative of American industry.

Electrical equipment and aircraft industries, the survey showed, exceed all others in the size of their research and development programs. Together, these industries accounted for $1.5 billion of the 1953 research and development cost. The chemical industry, however, far surpassed all others in dollars spent for basic research.

Of the 554,000 scientists and engineers employed by the surveyed industries as of January 1954, the largest groups included 409,000 engineers, 60,000 chemists, 11,000 metallurgists, 10,000 life scientists, 10,000 earth scientists, 8,000 physicists, and 6,000 mathematicians. Also included were about 34,000 scientists and engineers classified by their companies as administrators.

Advanced Study School For M.I.T.

In line with a suggestion originally made by Professor Martin Buerger, chairman of the faculty of the Massachusetts Institute of Technology, it has been decided to establish a School for Advanced Study at the Cambridge institution. The purpose of the new school, according to M.I.T. President James R. Killian, Jr., would be to provide a forum where top scholars from throughout the world could join the M.I.T. faculty in high-level theoretical studies and research.

"The advance in knowledge," Dr. Killian said, "makes it increasingly important for scholars to pursue advanced study beyond the level of the graduate school to the doctor's degree. In fact, the advancement of science particularly requires more postdoctoral study and research in our educational institutions."

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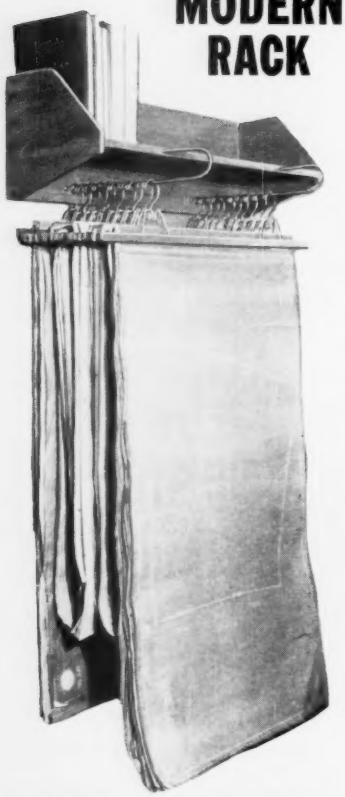

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Bronk Gets Chairmanship Of National Science Board

Detlev W. Bronk, president of the Rockefeller Institute for Medical Research, New York City, is the newly-elected chairman of the National Science Board, the governing body of the National Science Foundation.

Paul M. Gross, vice president and dean of Duke University, Durham, North Carolina, has been elected vice chairman of the Board and chairman of its Executive Committee.

Engineering Emphasis For New College

A new college of liberal arts, which will emphasize basic science and engineering and bear the name of the late Harvey Seeley Mudd, Los Angeles mining engineer and civic leader, will be established at Clare-

NSPE Spring Meeting—February 17, and 18, 1956, Mayflower Hotel, Washington, D. C.

Minnesota Society of Professional Engineers—Annual Meeting, February 22-24, 1956, Nicollet Hotel, Minneapolis, Minnesota.

Kansas Engineering Society—Annual Meeting, February 23-24, 1956, Allis Hotel, Wichita, Kansas.

New Mexico Society of Professional Engineers—Annual Meeting, February 24-25, 1956, Alvarado Hotel, Albuquerque, New Mexico.

Oklahoma Society of Professional Engineers—Annual Meeting, February 24-25, 1956, Tulsa Hotel, Tulsa, Oklahoma.

Tennessee Society of Professional Engineers—Annual Meeting, February 24-25, 1956, Andrew Johnson Hotel, Knoxville, Tennessee.

Georgia Society of Professional Engineers—Annual Meeting, February 25, 1956, Dinkler Plaza Hotel, Atlanta, Georgia.

Nebraska Society of Professional Engineers—Annual Meeting, March 17, 1956, Omaha, Nebraska.

Ohio Society of Professional Engineers—Annual Meeting, March 22, 23, 1956, Biltmore Hotel, Dayton, Ohio.

NSPE State Presidents' Conference—March 23-24, 1956, Biltmore Hotel, Dayton, Ohio.

Illinois Society of Professional Engineers—Annual Meeting, April 12-14, 1956, Morrane Hotel, Highland Park, Ill.

Iowa Engineering Society — Annual meeting, February 28-29, 1956, Hotel Ft. Des Moines, Des Moines, Iowa.

Florida Engineering Society—Annual Meeting, April 25-28, 1956, Pennsylvania Hotel, West Palm Beach, Florida.

Indiana Society of Professional Engineers—Annual Meeting, April 27-28, 1956, Van Orman Hotel, Ft. Wayne, Ind.

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•

mont, California, according to William W. Clary, Los Angeles attorney and chairman of the Board of Fellows of Claremont College.

❁

NSPE Members Honored By U. of Pennsylvania

Two members of the National Society of Professional Engineers were among the twenty-three engineering alumni of the University of Pennsylvania honored with "Centennial Citations" recently for their professional achievements, contributions to the public welfare, and service to their alma mater. The NSPE men, who received the awards with the others during a banquet climaxing the University's observance of its one hundred years of engineering instruction, were Thomas E. Bruder and Charles S. Leopold, both well-known Philadelphia consultants and members of the Pennsylvania SPE.

❁

Chamber of Commerce Office for Roush

C. G. Roush, a past vice president of the National Society of Professional Engineers, has been elected a vice president of the Kansas City, Missouri, Chamber of Commerce. Mr. Roush, who assumed the new office in December, heads the Chamber's Membership-Service Department.

❁

Chemical Engineers Elect

Dr. Walter G. Whitman, head of the Department of Chemical Engineering at the Massachusetts Institute of Technology, has been elected president of the American Institute of Chemical Engineers.

❁

ASEE Journal Has New Editor

Professor E. C. McClintock of the Civil Engineering Department of the University of Illinois has been named as the new editor of *The Journal of Engineering Education.* The announcement of Professor McClintock's appointment was made by the American Society for Engineering Education, which publishes the *Journal.*

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THE WHITE HOUSE
WASHINGTON

Gettysburg
December 15, 1955

Dear Mr. Neff:

On the occasion of National Engineers' Week I am glad to pay tribute to the engineering profession, to the men whose practical applications of scientific knowledge have played a major role in our nation's achieving the highest standard of living the world has ever known.

In this age of accelerating technological progress our need for engineers to help maintain national security and promote the national welfare is continually expanding. This fact gives rise to one of the major problems now facing America -- the problem of maintaining an adequate flow of well-qualified young people into our engineering colleges. An accompanying problem is to make sure that industry and government make the best possible use of the talents of our present engineers.

I hope the programs of National Engineers' Week in 1956 will serve to acquaint many of the talented and creative youth now in our high schools with the splendid opportunities for national service which are open to them in the engineering profession. I also hope these programs will increase among our citizens in general a knowledge and appreciation of the debt this country owes to the engineering profession.

Sincerely,

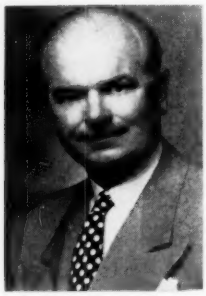
Dwight D. Eisenhower

Mr. Allison C. Neff
President
National Society of Professional Engineers
1121 Fifteenth Street, N. W.
Washington 5, D. C.

American Engineer

The Magazine of the Registered Professional Engineer

VOLUME TWENTY-SIX NUMBER TWO



Mr. Neff

About Our Week

by

Allison C. Neff, P.E.,

President, NSPE

THE receipt of a tribute to the engineering profession from President Eisenhower has once again underscored the significance of National Engineers' Week, which we will observe from February 19th to February 25th. As the President has pointed out, our accelerating technological progress as a nation highlights the role of the engineer in maintaining national security and promoting the national welfare.

In thus serving his fellow citizens, the engineer must quite literally live in the future because it is only by taking the long look ahead that he—and we—can be reasonably certain that today's preparations and activities are an adequate base for the pyramiding technology of tomorrow. The National Society of Professional Engineers, which sponsors the Week, has, therefore, selected the theme, "Engineering . . . Builder of a Brighter Future," as the most appropriate motto to keynote the observance.

It was chosen because it was felt that it was singularly pertinent to the mission of the engineering profession whose members must use all of their technological prowess if they are to create a better future for humanity and thereby fulfill the requirements for recognition as professional men.

SERVICE to his fellow men is one of the best measures of a man—and the only measure of a profession. We must rededicate ourselves to this ideal if we are to be worthy of the recognition and the tributes which this Week will bring.

We must be prepared to lead because the engineer is definitely destined for leadership in applying the knowledge gained today to the needs of tomorrow, and in anticipating the sort of knowledge that will be needed and must be searched out tomorrow to serve the generations of the still more distant future. But we must also remain aware that a good deal of the engineer's contribution will be comprised, as it always has been, of the lonely, behind-the-scenes sort of work that puts the sinews in a nation. The engineer may not always be the man who rides in the lead automobile at the head of a parade of the future, but he most certainly will always be the man who put the car on the road (and built the road, too).

The immensity of TOMORROW and its potentialities is a welcome challenge to the engineer who hopes to build that brighter future. With the Engineers' Week theme in mind, the AMERICAN ENGINEER has keyed much of this February issue to the future. Six of the country's leading engineers have accepted invitations to give their appraisal of Tomorrow's Engineer—in top management, manufacturing, research, education, government, and the armed forces. Some of the predictions have been projected to the year 1976, when the United States will be celebrating the two-hundredth anniversary of the Declaration of Independence, and what these guest authors have to say will interest and even amaze you.

BUT, lest we forget the great heritage of our profession, in our proper concern with the future, you will also find presented in these pages a new assessment of George Washington, the Nation's first great Engineer-President. As all members of the National Society of Professional Engineers and citizens from all walks of life throughout the country prepare to observe the week of his birth as National Engineers' Week, we cannot fail to add our note of appreciation for the fact that his early service, in helping establish the independence of the United States, created an ideal climate of freedom in which our profession could grow and prosper and thus help produce a civilization with a standard of living and a standard of concern with the individual and his needs which has never been surpassed.

Tomorrow's Engineer

AS civilization in all its phases becomes more dependent upon the skill of the engineer, the scope of his responsibility increases proportionately. Tomorrow will, therefore, be a thousand times more complex for him, and tomorrow's engineer will be many persons.

It is impossible in only a few pages to analyze completely his future status and to delineate all of the many fields in which he will work. In order, however, to spotlight the role he will have in certain broad areas, the AMERICAN ENGINEER has asked six outstanding engineers of today to take a well-considered look at their counterparts of tomorrow and let us know what they see.

You will find many points of agreement and many variations of opinion in these articles. Each is a unique contribution, and we are very pleased to introduce their authors to you.

Top Management

K. A. Spencer, Pres., Spencer Chemical Co., Kansas City, Mo.

Manufacturing

Arthur F. Vinson, Vice Pres. of Manufacturing, General Electric Co., Schenectady, N. Y.

Armed Forces

Maj. Gen. William M. Creasy, Chief Chemical Officer, Dept. of the Army

Research

Dr. Charles N. Kimball, Pres., Midwest Research Institute, Kansas City, Missouri

Government

W. A. Dexheimer, Commissioner, Bureau of Reclamation, Dept. of Interior, Wash., D. C.

Education

Joseph Weil, Dean, College of Engineering University of Florid Gainesville, Florida

IN TOP MANAGEMENT

"A general knowledge of all that goes into making a business function is a first . . . prerequisite."

Mr. Spencer

THE history of engineering and the study of the physical sciences will always be highlighted by the peculiar and unique genius of such as Galileo, Copernicus, Newton, Watt, Bell, Marconi, Edison, Einstein, Hoover, and the many others who have nobly advanced man's understanding of his universe, or have developed useful applications for hard-won fundamental knowledge.

None of us need to be reminded of the almost miraculous engineering triumphs which fill our everyday lives. We communicate sound and picture almost instantaneously around the world; we propel our carriers of men and material through the sky at speeds faster than sound; we tap the tiny atom for unbelievable power; from our earth's natural resources we create materials that Mother Nature in all her knowledge would never have dreamed possible; we talk of interplanetary travel as just around the corner. Certainly no civilization in the history of man has accumulated a like environment.

This demonstration of applied science for useful work has been the result of the application of engineering. Webster defines engineering as "applied science concerned with utilizing inorganic products of earth, properties of matter, sources of power in nature, and physical forces for supplying human needs in the form of structures, machines, manufactured products . . . and other productive work."

If we may subscribe to this definition, then we might properly term this era "The Age of Engineering." The engineer has made possible the economical application of scientific principles in our technology. Engineering developed mass production methods, automation, synthetic fibers and resins, and the industrial genius which makes possible our high productivity and standard of living.

When our manufacturing techniques were simple, little or no specialized technical knowledge was required. The artisan skilled in weaving, blacksmithing, carpentry, and the like could produce satisfactorily. Today it is an unusual manufacturing enterprise that does not need engineering know-how of many specialties. Men who can apply the principles of mechanics, heat, electronics, power, and the like are almost indispensable in any kind of manufacturing business. In 1900—just one generation ago—30 engineers were required for every 10,000 industrial workers. Today more than 200 engineers are needed for every 10,000 workers, and this ratio is rapidly rising. As engineering technology has created this marvel, so engineering is even more essential to maintain our continued growth.

More and more it is desirable to have top management armed with technical understanding to keep abreast of rapidly changing circumstances. All phases of the business world find engineers playing a more important role. Even financial institutions call on engineers to interpret the intricate complexities of specialized industry. Tomorrow's engineer will be even more in demand in more varied positions.

However, the role of tomorrow's engineer in top management has some qualifications. Regardless of the future growth of technology, the management of a business enterprise demands certain qualities which are as constant as the northern star. A discussion of these qualities will help give us a better feeling for what manner of man this top manager is. A general knowledge of all that goes into making a business function is a first and universal prerequisite. An appreciation of what makes people act as they do, of finance, sales, and research, as well as the techniques of production and engineering, must be the equipment of the manager. In addition, the manager should have the facility for separating grain from straw and keeping oriented on the major and important problems; the facility for understanding and grasping the significance of many, sometimes apparently unrelated, facts into a unified and composite picture which permits sound planning and direction; and, most important, the facility for understanding and encouraging the best from the human ingredient which after all is basic to industry.

THE engineer who finds a role in top management must have these qualifications—without them he will find it hard to manage. If he is equipped only with the technical understanding, he will be sorely handicapped. Conversely, the manager completely lacking in technical understanding walks with less than two good legs. Whether there will be more or fewer engineers in top management in the future will in a large measure be determined by the fitness of the individual engineer to fill the mold of tomorrow's manager.

An analysis of the engineer's education may help in appraising his capacity for management. In the last decade there has been substantial criticism aimed at the engineer whose education has been concentrated on technical knowledge important to the exercise of his applied science. Some critics assert that engineers are trade school graduates but are not educated because they lack the exposure to the humanities, arts, social sciences, psychology, and such. In answer to this criticism, a good many of the excellent engineering schools in the country have for several years pioneered the addition of broaden-

This Marconi bust, a gift to the American Institute of Electrical Engineers, is being unveiled by Marconi's daughter, Mrs. Gabriel Paresce, of Washington, D. C. The author names Marconi as an early genius in the fields of technology and science.

ing studies to the technical curriculum. The idea being (1) to prepare the engineer to express his ideas clearly and concisely in speaking and writing, (2) to give him an understanding of and convictions about his responsibilities as a citizen, (3) to provide him with a knowledge of the background of the social organization within which he lives, and of the great expressions of the human mind concerning man and society, and (4) to stimulate his interest in some aspect of the humanities or social studies as a basis for continued interest in these pursuits.

This type of work often entails additional crowding of an already crowded academic schedule. A popular suggestion recently has been to lengthen the engineer's course of study from four to five years. While there is unquestioned merit in opening broader fields for the engineer's appreciation, there are some problems to overcome. These courses should not be added at the expense of the applied sciences—for in that specialty the engineer will perform his major service. A five-year course might add severe strain to academic facilities which will be near bursting soon enough anyway. In 1955, college enrollment was a packed 2,500,000, while 1975 estimates predict more than 5,000,000. A five-year course might make a difficult situation even more so. Tomorrow's engineer will profit from this broadened educational base regardless of the method employed.

To believe that education is a terminal thing which stops with the college degree or the twenty-second birthday is an error of the first magnitude. The formal classroom instruction should be the broad base upon which is built continued learning accumulated day by day by the alert, hungry mind. Tomorrow's engineer should broaden his interest in the classroom if possible; and, after he becomes a practicing engineer, he should continue that study. The humanities and other broadening studies are sometimes more easily acquired by home study than some very technical subjects.

The licensing of professional engineers should certainly be encouraged. Measuring up to the standards and ethical intent of the professional engineer is important in building the man who will succeed in management.

An engineer should be able to communicate ideas clearly and forcefully. This means he should have a solid grasp of written and spoken communication tools. These come not so much from training as from practice. As practiced skills, they are acquired by an alert individual who is dedicated to improving his facility with them.

A one-eighth inch scale model is helping Clark Equipment Company engineering executives design and plan production operations for its construction machinery division's new manufacturing plant at Benton Harbor, Mich. The author cautions, though, that "non-technical" qualities are needed as well as technical competence for executive leadership.

Given this educational background, an engineer must have, in addition, the qualities of executive leadership which are somewhat "non-technical" in nature to find a role in top management. The ability to sift facts for their relative importance and to reach reasonable conclusions on the basis of evidence rather than prejudice is critically important to the man in top management.

Interestingly enough, the engineer's day to day familiarity with the "scientific method" may serve him well. This ordered and systematic approach to a set of facts can be a tremendous assist for reaching sound decisions. While it would be in error to suggest that every engineer is equipped to approach a situation with this kind of perspective, it is fair, certainly, to say that he has the right background.

Tomorrow's engineer in top management should free himself from the trees and take a searching look at the whole forest. There are as many engineers as there are persons with other training who spend too much of their time examining situations under a microscope. This makes them like the four blind men examining the elephant in the old proverb. This kind of narrow perspective will never lead to the efficient direction of a modern and complex business enterprise.

Thus, the engineer looking ahead to top management responsibilities must cultivate those intellectual factors which encourage the examination of the whole animal

or the "big picture" in any given situation. This faculty is encouraged in the engineering classroom as it is in a good many other fields of study, but its day to day application demands a toughness of mind which will not be turned away from putting the pieces together the way they belong as in a jigsaw puzzle. No single piece of the puzzle will reveal the meaning of the whole picture, regardless of how interesting it may be.

In this day of tremendous specialization, the big picture becomes increasingly more difficult to visualize. The day of a daVinci being a master of the accumulated body of scientific knowledge as well as an artist, sculptor, engineer, anatomist, philosopher, botanist, and statesman is gone forever. There is just too much to know in any one of these fields to permit any one intellect, regardless of its genius, to practice it with consummate skill. Therefore, top management must be broad enough to be able to bring these specialties into a comprehensible whole for a business to be successful.

Regardless of the perfection with which we develop our machine world, the most important ingredient in a successful business is the same as it was in the beginning —people. An executive with all the credentials to be successful who lacks a sympathetic understanding of the human ingredient simply cannot demonstrate the capacity for leadership essential for his success.

MORE words have been written about what makes a leader than there are rocks for the geologist to study. Some leaders are surely born, and others are surely made. What all leaders have in common is the sincere and honest appreciation for and understanding of other human beings. This, too, the engineer in top management must have to be successful, and no one knows exactly how it is acquired.

It would probably be considered improper in an article of this nature not to make an exhortation for the demonstration of certain other qualities which are common to the executive, such as personal initiative and industry. It has been my observation that very few executives reach their position working only a 40-hour week.

As we get our feet set solidly into the new year, we know that the role of the engineer will be more and more important in the future. The intricate and complex design of our society demands the professional skill of the technically trained in all phases of business. Fortunately, tomorrow appears to be ripe with opportunity and adventure. Tomorrow is made to order for the qualified engineer; tomorrow belongs to the imaginative, the industrious, the adventurous. And that is as it should be —for without adventure, civilization is in full decay.— ***End.***

IN MANUFACTURING

"The limits of his accomplishment may well be established by his own creativity."

Mr. Vinson

THERE is a definite challenge for the engineer in manufacturing. The position of "tomorrow's engineer" in manufacturing is dependent upon the acceptance of this challenge. It is not a new challenge—the opportunity for the application of sound engineering principles and practices to the problems of manufacturing has always existed and will continue throughout the future. For "tomorrow," however, this challenge is even greater due to technological progress in products and processes. Tomorrow's engineer—the engineer of 1965 or the future engineer of 1976—will find far more complex and challenging problems in manufacturing than his counterpart of today.

Unfortunately in the past it has been too often the engineer who has failed to recognize this challenge. Products and machines have been designed, but the interrelationship of these two was often a "let the shop make it" attitude. Before the start of the twentieth century, Frederick W. Taylor pioneered scientific management. Later the Gilbreths, Carl G. Barth, Morris L. Cooke, Henry L. Gantt, and others forged ahead and industrial engineering—reflecting "industry" and "engineer"—began to have definite meaning. Recent scientific and technological progress of the industrial engineer foretells the full acceptance of this field of engineering as only a matter of time.

Manufacturing, on the other hand, offers a definite challenge to *all* engineers. The successful meeting of this challenge will result in the continued and improved production of more goods and services for more people at lower costs through better manufacturing. Competitive growth in industry demands the meeting of this

challenge. Continued expansion of the nation's economy and our enviable standard of living are the inevitable results.

More and more engineers are accepting manufacturing as a career. In 1900, United States industry as a whole employed an average of one engineer for every 250 employees. By 1952, the ratio was down to one in every 60 employees. Today, the comparable statistics for General Electric is one engineer for every 20 employees.

Some of this trend can be attributed to the increase of engineers in manufacturing. At General Electric in the middle 30's we had only 5 per cent of our technical people (graduate engineers) employed in the manufacturing function of our business. In the post war period this figure grew to 8 per cent, and today we have about 15 per cent. Present plans indicate that by the early 60's we will have from 25 per cent to 30 per cent of our engineers actively participating in the manufacturing phase of our operations. As a matter of record, several of our operating departments today have *more* engineering graduates in manufacturing than in the product-design engineering function itself.

Evidence of the movement of engineers to manufacturing as a career is further substantiated by a look at manufacturing management in General Electric. Of our manufacturing executives, 52 per cent have engineering or other technical degrees.

GREATER participation of the engineer of tomorrow in manufacturing is not only indicated but is absolutely essential due to the anticipated growth of our national economy. From 1939 to 1955 the annual gross national product increased from $91 billion to $357 billion; the prediction for 1965 is $500 billion. What might it be by 1976—just 200 years after the Declaration of Independence? In the next ten years the industrial investment ratio of equipment to land and buildings will change from 2 to 1 to an anticipated 4 to 1. Engineered equipment and processes will be of much greater importance than bricks and mortar. Factory output over this same period of time will increase at least 50 per cent. What will be this investment ratio and factory output in 1976? All of this indicates that we are committed to an ever increasing rate of productivity. The very backbone of our expanding economy is the ability to produce through more efficient manufacturing.

This presents a real problem to American industry. By 1965 we must produce 40 per cent more goods and services with only 13 per cent more people. Thus, increase in productivity must exceed the increase in work force by over three times by 1965. There is no question that the challenge of this problem will be met. This increasingly productive future is simply an extension of our past technological progress.

It is true that by 1976 the available working force may present a more favorable ratio to the required national output. However, the momentum of the required development over the next ten years should result in an ever increasing consumer demand, the fulfillment of which may not permit the shorter work week—the other alternative for proper balance between workers and total productivity.

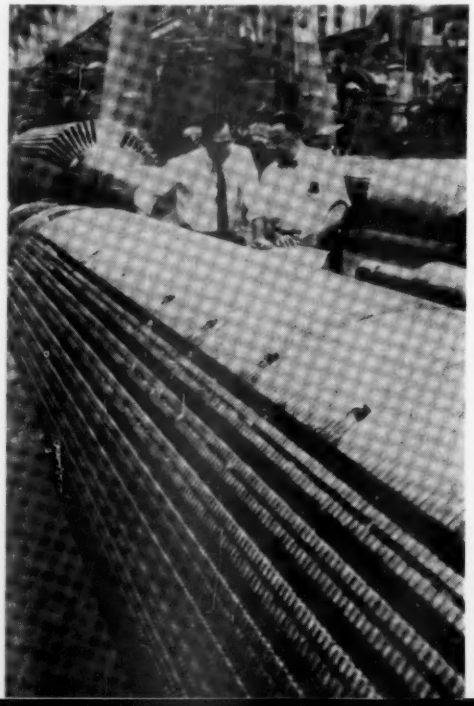
Manufacturing must grow technically so that more goods and services can be produced with fewer but more highly skilled workers. The current term for this is "automation." At General Electric we consider automation to mean "continuous automatic production." Further we do not view automation as a problem—rather it is the solution to a very real problem in productivity if our economy is to grow.

AUTOMATION, of itself, is not new. It is just another phase in the technical progress of manufacturing. In 1874 Oliver Evans built a completely automatic flour mill in Philadelphia—this was fully automatic with no workers in the building. Many process industries—notably chemical and foods—have employed automation for many years. Mass production of other products has permitted the application of the principles of automation to their manufacture. The next logical step is application of these same principles to more complex products—and through flexibility of equipment to multi-product lines. Thus automation is not a second industrial revolution—it is evolutionary, not revolutionary.

The impact of automation on industrial personnel must be anticipated. While some temporary displacement is inevitable, the end result will be the upgrading of the factory worker from unskilled, semi-skilled and skilled artisans to skilled technicians. The factory equipment of the future will be more complex—mechanically and electronically—and the operator will require technical know-how for optimum productivity. By 1976 the foreman of such a complex operation might well require an engineering education.

Again, let us point out this is a progressive development. The automatic push-button factory is not "just around the corner." The principal problem is one of economics. Application of automation to an industry is no longer a question of "Can it be done?" It is a question of "When should it be done?" Automation must pay its way step-by-step with the inevitable advance in manufacturing technology.

Two General Electric Company engineers check plans in the company's large steam turbine-generator plant at Schenectady, N. Y.



One further thought: economical application of the principles of automation involves more than just manufacturing. Automatic production to be economical requires a large volume of the product to be manufactured, hence marketing and analysis of markets is involved. The product must be designed for automatic production, thus the design engineer is involved. The equipment is costly, so finance is likewise concerned. Automation is a problem for the total industrial activity.

Where tomorrow's engineer fits into this future picture of the production of goods and services is self-evident. In fact, due to the total sphere involved in the adoption of advanced manufacturing techniques, opportunities for the competent engineer will be in functions other than just manufacturing.

THE engineering approach is proving effective in market-forecasting. There is obviously a close correlation between profits and a valid forecast of sales. Technological progress in products—as well as the automatic equipment for the manufacture of such products—indicates an increasing demand for the engineer in sales and service of product and equipment.

Traditionally, engineers are responsible for product design. In the future this responsibility must include designing of the product for more economical and automatic production. Whether an engineer from the manufacturing function acts as a liaison with the product designer—or the situation is reversed—is immaterial. Knowledge of advanced manufacturing techniques and workability of materials must be considered at all times when product designs are being developed.

The development of automatic equipment is in itself an adequate challenge for the engineer in manufacturing. The complexity of such equipment—servo-mechanisms, selsyns, electronics, punch card and tape devices—all require engineering skill and knowledge when applied to a manufacturing problem. The limits of the accomplishment of tomorrow's engineer may well be established by his own creative ability.

Complementing the development of the manufacturing equipment is the design of the total manufacturing process. This principal activity of today's manufacturing engineer will be much more complex in the future. More advanced processes and techniques will be available and their application known. Economic factors involved must be common knowledge and the degree of automaticity in the process determined on an economic basis.

In the production of goods and services the increasing technical content of product and process will demand higher skills of the operator and engineering knowledge of supervisory personnel.

Quality of product must be controlled throughout the entire cycle. Quality engineers thoroughly familiar with process capabilities must take part in decisions of product design, planning of processes, and finally, through quality control techniques, inspection, and tests, must insure that the product is made right the first time.

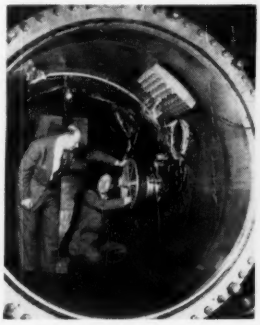
THE control of production will offer many opportunities. While basically a problem of communications, the adaptability of electronic computers and other devices opens a wide field to the engineer for a major contribution to the economic operation of the total manufacturing activity. Mechanization of control procedures is today an active field of development, the ultimate efficiency of which is still to be accomplished.

Finally, the development of adequate measures of manufacturing efficiency will be a continuing complex problem—an opportunity for a real contribution by tomorrow's engineer.

Obviously there is no current engineering curriculum that will qualify the engineering graduate to become effective overnight in all these fields. Possibly such a program of study would involve too many years of schooling to be practicable. What kind of engineers perform these jobs today? All kinds! It seems apparent that the discipline of engineering logic and the basic ethics of the profession will be the keystones of success—these with a real desire for continued professional self-development once the engineer enters the manufacturing field.

Where in the field of manufacturing will we find tomorrow's engineer in 1976? He will be held in professional regard and attain financial status in direct proportion to his acceptance of the manufacturing challenge to produce more goods and services, for more people, at less cost.

Part of this he will accomplish through automation—but his comprehensive and thorough knowledge of all factors involved is prerequisite to his success in 1976!—*End.*



In the future, the author points out, quality of product will be more important than ever. Here at G-E's Lynn, Mass., plant is a test cell for jet engines.

Far right: Design of product is reviewed by a General Electric Company engineer with workman in one of G-E's factory buildings at Schenectady.

Maj. Gen. Creasy

IN THE ARMED FORCES

"He will be the 'executive type,' using a multitude of 'tools' . . . to bring his ideas to fruition."

FOR centuries the basic art of warfare remained unchanged as strategy and tactics, plus sheer weight of manpower, were the deciding factors. The application in recent years of science and technology to weapons and their uses has completely transformed what was once considered "an art" into "a science." The primary factor today is superiority in technology and the ability to adapt it to human energy.

The role of the scientist in today's civilization is to think and research ideas. The engineer transforms those ideas into the realm of practicability for man's use. Thus, the engineer of today—and tomorrow—is an all-important catalytic influence for advancement.

The Armed Forces are a blend of American character, military tradition, and the best that American science and technology can contribute. The American regard for human life is reflected in every aspect of our military organization, and the substitution of machines for men will continue as new developments come along. But the ultimate extent to which machines can successfully replace men is one of the unknowns of the modern world—so large an unknown that both the free world and its adversaries have seen fit to maintain large armies. As long as there is war, much of it will be fought on the ground, and that means machines *and* men. Although air or sea power may reduce the enemy's will to fight back, victory cannot be claimed until manpower, individually and collectively, occupies enemy territory. That is the final decision in any warfare, and is the target toward which all military advancements, no matter in what field, are aimed. Technology has done much to ease this job, but at the same time it has deepened the battle zone from thousands of yards to thousands of miles.

DURING the past twenty-five years we have seen exceptional growth and development in basic engineering knowledge and application; a profession has come of age and continues to grow with speed and variety. The ability of the engineering-trained mind to think clearly, analytically, imaginatively, and with celerity has done much to further the growth of our nation. However, today, military and industry alike feel the pinch of a shortage of engineering talent. Neither segment, though, can afford to fill its needs at the expense of the other.

The answer, then, lies in an even closer integration of work between the industrial engineer and the military engineer within the framework of the industry-military partnership which has been built up in the past two decades.

There are two fields in the Armed Forces in which the engineer is the prime factor—the field of engineering and development where we obtain quality of materiel, and the production field from whence comes the quantity. Military research and development is primarily a peacetime activity, while production comes to the fore in times of national emergency; for research and development consumes an average of five years between the drawing board and production. Production, on the other hand, can be a relatively simple matter—if sound, prior planning is carried out in the peace years.

However, there must be a "bridge" between the research and development agency and the industrial facility that will produce the item. Across this "bridge" must pass the Armed Forces' end items. Experimentally, they are designed to meet the military requirements, but they are not always completely tailored for economic mass production, optimum use of materials, maintenance, human factors, and industrial processes. While on this "bridge," they are engineered with due regard to these factors, and the item leaves the "bridge" ready for production. This is the field of the production engineer in the Armed Forces—paving the way toward the achievement of the "quantity" goal in times of national emergency. Within the Chemical Corps, this "bridge" is the Engineering Command.

The Chemical Corps utilizes almost every form of engineering known. This is because the Corps has what might be termed the broadest mission of any Department of Defense agency: to give our nation the capability to defend itself against chemical, biological, and radiological warfare, if it should become necessary. The research and development, procurement and production, and training connected with toxicological warfare are done not

just for the Army, but a certain amount is also done for the Navy and the Air Force, as well as such civilian organizations as the Federal Civil Defense Administration and the U. S. Public Health Service.

As this program continues to grow, more and more engineers in industry will find that their special talents can be utilized by the Armed Forces without having to leave their civilian employment. As industry meets the many challenges that military research requirements pose, advancements will be made; and, with each advancement there will be new challenges, creating even more new fields of engineering.

Although much of the Armed Forces developmental work will be done by industry in the future, there must always be a hard core of imaginative scientists and technicians within the military to establish and define the work to be performed, to provide the defense mission with a continuity of work and skills, and to coordinate the thinking within and without the military organization. The military must be the seed bed of new ideas for new weapons and equipment, fostering their development and growth. Uninhibited speculation by the nonmilitary on possible weapons and the methods of converting them to effective instruments of combat and of developing the necessary defenses against such weapons must be encouraged.

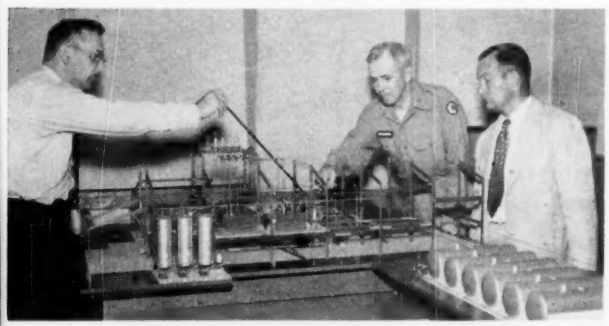
This military-civilian team is necessary on almost any project. The military man has the knowledge of the particular requirement. The engineer has the fundamental technical "know-how" to fill the requirement; but the soldier must also be educated to speak the engineer's language. Recognition of the value of the technically-trained military man is evident. Prior to Pearl Harbor, 15 per cent of the Chemical Corps' regular officers had scientific or engineering degrees; today the figure has risen to 63 per cent—44 per cent with scientific degrees, 19 per cent with engineering degrees. Among our reserve officers serving on active duty, better than 12 per cent have engineering degrees, while 21 per cent have scientific degrees.

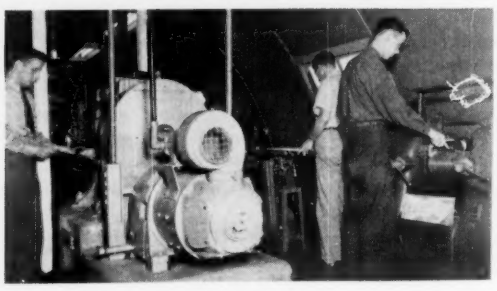
A RECENT survey on scientists and engineers in uniform conducted by the National Science Foundation showed that about 50 officers in all military services have Ph.D.'s in engineering, and about 4,200 have master's degrees. There were also about 11,000 officers with bachelor's degrees in engineering who were engaged in such assignments or had primary or secondary military specialties related to engineering and science.

The problems facing the engineer in military research and development are much more complex than those found in industry. He must look upon a given project situation from six different viewpoints: as the leader of a specific program or project; as a follower of higher-level directives; as an efficient engineer at the working level; as the ultimate user of the item, be he soldier, sailor, or airman; as a taxpayer who must support the defense program; and as a member of civilized society. He must also consider the extremes of weather, transportation, storage, skilled and unskilled personnel, and combat conditions under which the item will be used.

In addition, the imagination of tomorrow's military engineer will be taxed even further. The Armed Forces recently restricted the items entering the military supply system to those which could be classified as "bold new advances." The adoption of the "bold advance" theory is no bar to true progress, but it means that we will have to be satisfied with something "almost as good" until technology produces something a whole lot better.

Within the Armed Forces, the day of the "dirty handed" engineer is ending. Probably by 1976 he will be the "executive type," using a multitude of "tools"—human and otherwise—to bring his ideas to fruition. He will have a staff of administrative assistants, technicians and skilled laborers to do the actual work, as he directs. His main concern will be the over-all picture of his own project and how it will fit into the "big picture" of the Armed Forces.





Left, above: The engineer in the Armed Forces will use scale models more and more to convey his ideas rather than blueprints. Here, Stanley P. Shukis, a project engineer, uses a scale model to illustrate a point to Colonel William J. Allen, Jr., (center) Commanding Officer of the Chemical Corps Engineering Command, and Louis E. Garono, (right) Chief Engineer of the Engineering Command. Mr. Garono is a registered professional engineer. Of the Command's civilian personnel, 38 per cent are engineers.

Left, below: Tomorrow's engineer in the military will be a "thinker." Technicians and skilled labor will carry out the actual work on his project.

Opposite page: Dr. James A. Bender, physicist, at the snow, ice and permafrost research establishment, Wilmette, Illinois, uses a special apparatus to disintegrate snow in one of the cold room laboratories. The project is directed by the Army Engineers.

There will be a greater need for engineers trained in the broad, rather than specialized, fields. Noted engineering educators have already pointed out the need for a change in technical training.

The engineer will have to conserve his time wherever possible. One way will be a further adoption of the practice used by architects—scale models—to convey and explain his ideas. The Chemical Corps, for instance, is already adopting this method and finds that intricate drawings will take three or four days of study while a model will provide the needed information in one-third the time. He will also use "building block" designs—standard designs for standard portions of an over-all project—as a time-saver.

He will also find more and more use for the statistician to build validity into a specific item and to wring the maximum benefits from every particular action regarding a project. The statistician, using his facts and figures on past performances of items and their component parts, brings a new concept into the research and development field. The statistician-engineer team may produce, for instance, a new mortar shell that will be so nearly perfect that we may reduce the costly destructive testing used today to determine the efficiency of the item.

Today, throughout the Armed Forces increased attention is given to "imaginative planning." Industry has recently found that generation of ideas by systematized techniques pays off in dollars and cents and taps hitherto unsuspected reservoirs of ideas. One method is the use of the conference whereby a specific problem is presented to a group which offers ideas for the solution of the problem, regardless of how radical the solution may seem. Tomorrow's engineer will find such imaginative planning a necessary "tool" as he works to solve the as yet unseen challenges of the future.

Basically, the engineer of the future will be working toward a fuller realization of the term "automation." He will seek further reduction in the manpower needs for weapons and combat operations; in the business and administrative functions of the Armed Forces; and in the production of military equipment.

The military research effort must be oriented to development of new weapons of maximum potential, irrespective of particular concepts of warfare. These developments are essential for the deterrent effect our possession of them can have on possible future wars, for their aid in defensive measures, and for their actual use if need be.

The encouragement and effective utilization of the nation's technology will continue to be a decisive factor in our national defense system. In all fields of scientific and technical endeavor the nation's defense needs will continue to call for the finest effort and the best result of which man is capable, on the research and development front, the production front, and the combat front. The pre-eminence of the engineering profession in all its forms is essential—for the avoidance of war, or for survival in war, and for contributions to a better civilization.—***End.***

Dr. Kimball

IN RESEARCH

"He must face the necessity for constant personal intellectual evolution."

The increasing importance of research to the economy and security of this nation is demonstrated in many ways. Research has grown by a factor of 50 times over the past 20 years, due principally to the dependence of our entire economy on science, and to the outstanding accomplishments of research people, so apparent in the thousands of new products, devices, and processes.

We devote a higher percentage of our gross national product to research in the United States than does any other civilized country, and research is one of the most important single factors in our present national standard of living. Many companies claim that a discontinuance of their research effort would seriously cripple their business, and there are predictions that half of the products to be produced in 1975 or thereabouts have yet to be developed.

Products and processes emanating from research laboratories are obvious stimulants to our economy, but one must not overlook the additional catalytic effect of research upon capital dollars expended for new plants and equipment.

Research on its present scale is an outgrowth of the past war, which taught this nation the real value of the team approach. Progress was not directly related to the

large number of people involved, since research results cannot be mass-produced. The effectiveness of the effort resulted from joining together technical men of widely different skills to solve major scientific problems. Yet, only a quarter of a century ago, research was carried out pincipally under academic conditions. It was not very well appreciated or understood by industry, and not many companies had research groups of their own.

Today research is regarded as an essential operating department by most mature corporations, and in many ways it may be considered practically as a separate business entity organized to produce specific technology. This applies whether the research people are in the employ of a given company or acting as independent research organizations.

There are more than 400,000 people active in research today, with annual expenditures of about $41/2$-billion. The future possibilities are striking. Our gross national product in 1965 should be about $600-billion, and in 1975 $800-billion. Research will certainly keep pace, and some estimates indicate an $8-billion research expenditure by 1965, and $16-billion by 1975, at which time the research employment will exceed a million technical people. We now spend in the United States about 1% of the gross national product for research, with the estimates for 1975 indicating about 2%. This is indeed a very small investment in the future, when one considers the demonstrated influence of research on our national progress.

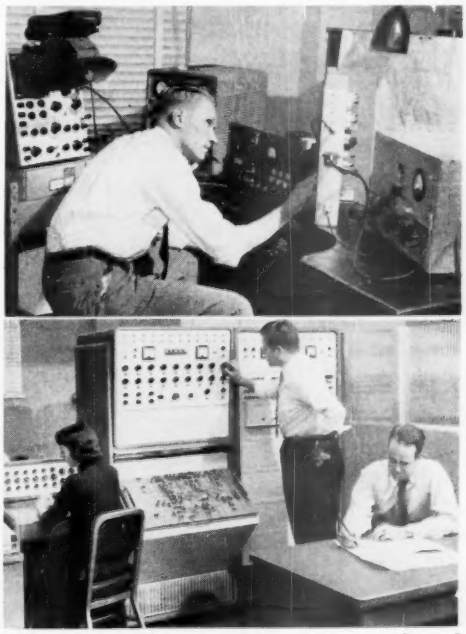
In the next decade or two, research groups will produce technology as an industrial product of their own, and the competition for men and ideas will reach major proportions. In today's research efforts, engineers play a very important role, and there is little likelihood that their participation will do anything but grow.

TOMORROW'S research engineer will differ in many ways from the man we know today. The organization of his activities, his educational preparation, and the problems he will have to solve will all be changed significantly. The systems concept of research engineering will be much more prevalent, and the organization techniques will require many different levels of effort. For most large research groups there will be technical coordinators of the different scientific fields, perhaps not unlike the general practitioners in medicine. In fact, future research efforts will probably take more of a clinical approach, with steps involving problem review, recommendations for detailed solutions, and assignment of groups of individual specialists. The research planner or coordinator will possess the unusual ability of knowing and understanding the detailed scientific skills of each class of specialists, and will have the ability to set up complex research systems to solve many fundamental problems. Most professionally trained research engineers may be working in problem areas which are established by those handling the over-all systems plan. Because of the complexities of tomorrow's systems research, small groups will be relatively ineffective. For this reason there will be a marked tendency toward many companies affiliating in specially formed research associations, or with established independent research organizations.

These approaches are in complete contrast to the older Edisonian method, in which the research engineer, inspired by an idea, continues experimentation until, after an enormity of attempts, he develops the final device. There will be neither room nor time in the future for this philosophy.

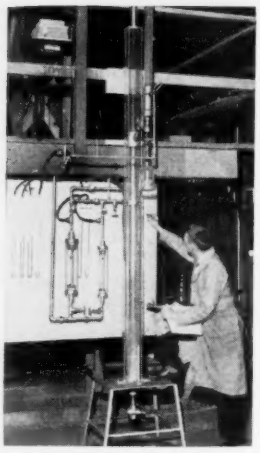
MUCH work will be done in attempts to control man's environment, and to predict and control disasters, such as floods, hurricanes, and other weather disturbances. Transportation methods will be changed markedly, and there will be much more emphasis on safety, as well as on higher speeds. Applications of advanced engineering techniques, used in the design of vehicles, will be made to structures, such as homes and commercial buildings. Unmanned aircraft will be commonplace, and space satellites a physical reality. Research engineers will not be confined to today's concepts of the laboratory sciences, but will play an important role in solving multiple business problems, as well. Their knowledge of the applications of computers, and of the principles of servomechanisms and feedback circuits will have great utility in the planning of production, and forecasting and control of inventories, for example.

The research engineer of the future will have access to many new tools, and the impact of evolutionary type computers will permit the solution of problems which today would not be attempted because of the enormity of work involved. As a consequence, the basic design of structures, vehicles, and machines will be accomplished more precisely, and design factors of safety will approach the optimum, thereby reducing weights and volumes appreciably.



Top: An engineer working on a complicated electronic circuit during a research project.

Bottom: One of Midwest Research Institute's computer installations. This analog computer simplifies the solution of many problems in all branches of engineering research.



A small pilot plant installation in which a chemical engineer investigates some of the basic laws governing fluidizing. It's all part of important research.

Statistics will become a more widely used tool in research, with widespread application of probability techniques in the design of experiments, to minimize data taking. This should be an important way to offset the probable continued shortage of research engineers.

Tomorrow's research engineer will require much more extensive education, with more fundamental training than he acquires today, and young men will have to make decisions early in their careers between the "research option" and the "engineering design option." There will be a gradual departure from the classical concepts of engineering research fields as we know them today—electrical, mechanical, civil, and chemical. In fact, the training of tomorrow's research engineer may resemble that of a physicist, with much more basic knowledge of mathematics and nuclear and solar energy applications.

THE technical schools will face some interesting problems. Courses emphasizing the acquisition of present knowledge will not do much for our new undergraduate, since too much training in existing problems and current methodology may well impede the fresh viewpoint which leads men to explore new areas of thought. The undergraduate of the future may be rated not by what he knows, but by the imagination he exhibits in approaching unsolved problems. In fact, in all forms of research the man who can see and formulate the problem usually contributes more than the person who actually solves it.

Even today enlightened research management recognizes these points and is trying all sorts of things to keep research people stimulated. Industry in the future will provide much more opportunity for continuing education through the research engineer's productive life. This will take many new forms, and will be a logical extension of his formal university training.

Attempts will be made in the future to pre-select men for careers in research possessing characteristics such as enthusiasm for new knowledge, curiosity about nature's problems, judgment to discern the significant aspects of technical situations, and imagination, i.e., the power to see not only what is, but what might be. Other attributes desired are drive, concentration, and the motivation which leads all real research people to take personal delight in overcoming obstacles.

Since tomorrow's research group will be larger and more heterogeneous, there will be much more cross-linking among apparently unrelated fields. Research engineers will be required not only to understand the terminology and technical reasoning of other research scientists, but must be able to communicate effectively with others.

Our future research engineer must face the necessity for constant personal intellectual evolution. What other people are doing in different fields of science will invade his daily life, and only the evolving person will be capable of maintaining his position as a research engineer. Any other approach will cause him to lapse into the role of technician.

Many of today's research workers are problem solvers, and are concerned more with the niceties of techniques than the imagination which results in brand new concepts. Our future research engineer will be concerned more with creativity, and will thus develop less concern for the boundaries of different technical fields.

THE research leader will be both a pace setter and a problem solver. He will have the leaping imagination which makes technology progress, not little by little, but by orders of magnitude. The concept of the "man year" generally will give way to the "idea year," since it is the new ideas which define progress rather than chronological time and money spent on a problem. This sort of approach will be required in the new economy based on technology. It is necessary also for the defense of this nation, involving new tools of warfare, new concepts of energy, and their utilization.

Of course, not all research engineers will possess these many attributes, and this is proper, since there will be more highly integrated planning for all levels of technical contributions.

For generations, the professional research scientist was considered in many quarters as a man incapable of being practical. This has all changed in the last decade or so, especially in this nuclear age, and the scientist has suddenly proved himself capable of accomplishment beyond the expectations and comprehension of most people. The well-trained research engineer in our technological era is a very essential person. He will have an increasing responsibility in all important affairs of the future, and the general public will become more attuned to his contributions. Perhaps after he has passed through his productive research years, he will no longer be retired or promoted to a research management position, but will enter a new career in managing industrial enterprises and governmental affairs.

From a financial standpoint, the research engineer has unlimited possibilities, if he is equipped with the right aptitudes and personal characteristics. Research can be as remunerative and gratifying a career as any that can be foreseen at this time.

Yet, despite all that has been written about team research, and no matter how technically sophisticated the nation becomes, one must not overlook the important fact that all progress originates in creative thought, which is a purely personal characteristic. And while the future for research will require much more group effort, it will also emphasize the need to discern and recognize individual genius. The essentially unique position of the individual research engineer must be maintained, without submerging him in any set of standards.—***End.***

IN GOVERNMENT

"He will be the new symbol of American diplomacy and good will."

Mr. Dexheimer

THE Atomic Age is making perhaps its greatest explosive impact on engineering talents and resources. The engineer has a key role in the tremendous technological development that began with the opening of this new scientific frontier just a few years ago.

He was not only called upon to plan and administer the work of reconstruction normally following a great war, but he also had thrust upon him the heavy responsibilities of carrying forward the dynamic postwar expansion and development. There have been placed upon him the overwhelming complexities of planning for a future of space stations, automation, electronics, atomic energy, national defense against thermonuclear aggression, and a host of other innovations of equal proportions and difficulty.

Tomorrow's engineer will fall heir to impressive accomplishments of the past but he will also face a still greater challenge of the future. In inheriting this tradition of fulfillment and promise, he must develop a greater proficiency than his predecessor and a greater awareness of the economic and social impact of his works upon his fellow men.

He must be prepared to spend more years in formal training and should seek a broader education than his predecessor. Training in administrative work will be as important to him as the acquiring of technical knowledge, and he should accept in-service training when offered as an opportunity to enhance his value to his organization. In short, he must attain a professional outlook in the fullest sense.

Unlimited opportunities for the engineer of tomorrow exist in both private and public agencies. In almost every field of endeavor he can add to the great accomplishments of the thousands of engineers in private engineering firms and in industry. These engineers with integrity, capacity, drive, and inventive genius have in large measure been responsible for America's stature in the world today.

Government service offers the future engineer singular opportunity for professional advancement. In my own sphere of reclamation and conservation, which has occupied the attention of the Bureau of Reclamation for the past 53 years, there is a fine tradition of public service and progress.

Reclamation engineers have built some of the highest and largest dams, the largest hydroelectric plants, and several of the most intricate systems of irrigation and power facilities in the world. They have obtained broad experience in many branches of engineering in the process. But more importantly they have done so in a spirit of good will and understanding, working with farmers, legislators, state and municipal leaders, and many others in the democratic, American way.

In our water and land resources programs for the arid and semi-arid regions of the West our skills have been taxed to fill immediate needs for water and land development and also to plan ahead to meet the future requirements of an ever-growing West. In every step of development of a Reclamation project—from planning through construction and operation—our engineers are known and respected for their technical achievements and public service.

THIS tradition of public service and progress is, of course, found throughout all of the 30 agencies of the Federal Government which employ about 47,000 engineers. Their work has far-reaching effects on the health, welfare, standard of living, and economy of the nation. The engineer in Government service is

Assistance to foreign nations in developing their water and land resources is an important activity of the Bureau of Reclamation. Its technical assistance in training foreign engineers, sending engineering advisers abroad, and in conferring with observers and visitors has helped countries throughout the world. A typical conference with representatives of the Thailand Government, as pictured above, included, left to right, M. L. Pilandh Malakul, engineer from the Royal Irrigation Department, Thailand; M. L. Xujati Kambhu, Director General, Royal Irrigation Department; H. E. White, and M. E. Day, both Bureau engineers.

sometimes labeled visionary. Yet, he is the one charged with planning for our future. He foresees the need and endeavors to meet it. The Government engineer has pioneered and developed many new things so vital to the advancement of civilization.

Pioneer public health engineers helped to bring typhoid fever under control, and others led in mine safety. Other career engineers advanced the design and construction of highways, waterways, harbor works, hospitals, and public buildings. They played major roles in developing revolutionary aeronautical safety devices and systems. They opened the way for new industries in developing such products as lightweight concretes, printed electronic circuits, miniaturized electronic equipment, and many other products. Synthetic rubber and oil from shale were first developed in pilot plants by Government engineers. Vital contributions were made for the national defense.

Throughout these and many other fields of endeavor the efforts of Government engineers have combined with those of engineers in private firms and industry to make the world a better and a safer place to live. Engineers trained in Government service have almost unlimited opportunities when they leave the Government. You will find them in key positions of responsibility all over the world.

Engineers in Government can take pride in the Grand Coulee Dam of the Bureau of Reclamation's Columbia Basin Project in Washington. The dam, named by the American Society of Civil Engineers as one of the seven modern engineering wonders in the United States, is the largest concrete dam in the world.

Probably one of the most rewarding experiences of the Government engineer has been his participation in technical assistance to the under-developed countries of the world. Such assistance, previously carried on in a small way for many years by Government scientists and sociologists, was given great impetus at the end of the war.

In 1948, the United States Government inaugurated, as a major foreign relations policy, a program to extend to many free countries assistance in their reconstruction and resources development. This plan accelerated cooperation of the technical, administrative, financial, and labor skills of many free people and combined them to solve the basic problems of using and conserving natural resources.

Today, engineers working under the sponsorship of the International Cooperation Administration of the State Department and other agencies are laboring in the four corners of the world, giving freely of their skills and energies to help the underdeveloped countries in improving their agriculture and industry.

We, in the Bureau of Reclamation, are proud of the part our engineers are taking in this world-wide good-neighbor program. Last year, we had more than 100 engineers in 20 foreign countries working with the people of these countries in developing their water and land resources. We are training engineers from foreign lands and rendering service to observers and visitors. We are also sending individual specialists and missions of Bureau engineers to other countries, and performing technical services such as testing, research, and design and specification review for foreign water resources development.

Working with peoples of widely varying cultures and traditions, and by his technical "know how" and devotion to duty, the engineer in foreign service has become today the new symbol of American diplomacy and good will. He has led the way to breaking down barriers of provincialism and can take justifiable pride in his attainments and stature as a contributor to better understanding throughout the world.

Because of the great demands that are now being made and will continue to be made for engineer's abilities in public and private agencies both here and abroad, a serious shortage of engineering talent has developed. To keep abreast of our phenomenal technological progress we must have about 40,000 new engineers annually. But we are graduating only 20,000 trained engineers a year—about half the required number. In fact, so serious is this shortage that the Defense Department has looked upon it as a potential threat to our national security.

Industry is attempting to meet the shortage of engineers by intensive programs of improving the professional and financial status of the engineer. Marginal tasks and subprofessional work are being channeled to technicians and clerical personnel of less technical training. The engineer's time is thus made free for the difficult analyses of problems requiring his specialized training and experience.

In Government, we have such training programs as the Department of Interior's annual selection of outstanding young engineers who work for a year in the Department's various bureaus and offices in training for future assignments as engineering administrators.

Within the Civil Service framework we have developed a professional staff of engineers of outstanding abilities and accomplishments. They have opportunity to transfer from one agency to another to broaden their field. We assist their professional growth by encouraging their full participation in technical societies, both in this country and abroad.

Many of our engineers have thus become identified with civic and national affairs requiring their experience

and counsel. Financial and administrative rewards have been given to engineers who display inventive ability and those who are willing to develop their technical proficiency by advanced study.

Despite these incentives and efforts of both public and private agencies to utilize available and new engineering talent more efficiently, the future of tomorrow's engineering progress lies ultimately within the engineer himself. Tomorrow's technology is so intimately interwoven with sociological implications that the future engineer cannot disassociate himself from them.

Automation for example—a Frankenstein to some and a new boon to civilization to others—places the engineer in the middle as the arbiter of its role in industry. Because of his technical knowledge and administrative capacity, the engineer will be in the forefront of the readjustment caused by the growing use of automatic devices in business and industry. His social and civic consciousness will be challenged repeatedly in this new human drama of automation.

Similarly, atomic energy conveys to all of us an immense hope for its peacetime uses and despair of its havoc in war. Tomorrow's engineer who must assist and guide in the development and utilization of atomic energy can enjoy no ivory tower of "engineering for engineering's sake," by divorcing himself from the impact of his work on the public welfare. The vigor of his ethical, social, and intellectual outlook must match this newest form of tremendous energy.

In the more commonplace fields of housing and transportation, the engineer of tomorrow faces a herculean task. Concerted efforts during the postwar years have considerably improved our national standard of housing, but it is still far below our over-all standard of living. Though thousands of new schools have been built to educate unprecedented numbers of children, the supply lags far behind the need. And though many miles of new super highways extend across the country, our rate of highway building must be accelerated greatly to provide safe pathways for our millions of motor cars.

In the field of water resource management, while we can look with satisfaction on our many past accomplishments, we recognize that future endeavors will become more difficult in direct proportion to the increasingly severe demands on our water resources. There must be greatly expanded research in finding new sources of fresh water, in reducing the losses now found in water management, and in obtaining better controls and uses of water for nonconsumptive purposes.

The engineer of tomorrow has a unique opportunity in the accomplishment of these challenging undertakings. But whether he chooses to work in a public or a private agency he holds an important responsibility. His grasp of the many problems and their sociologic and economic implications must parallel his engineering research.

If he chooses to work in a Government agency, the goal of tomorrow's engineer is clear. He, like his predecessors, must be in the vanguard of technical progress. As a public servant, he must always seek ways of achieving economy and efficiency in his work so that the beneficiaries of his talents will receive the best results at the lowest possible costs.

Administratively, he must assure himself and his associates that his plans are sound and in the public interest. Professionally, he must continue the past efforts of Government engineers to disclose fully to his fellow engineers and scientists the methods and fruits of his work.

As a citizen, he must take his place in society giving freely of his creative energies and leadership in public affairs. And, finally, he himself must have keen vision for progress and engender enthusiasm in his successors in the attainment of future goals in Government.—***End.***

The young engineer entering Government service, as shown above, has the opportunity to work with engineers and scientists of wide experience and professional background. Recent graduates of engineering colleges beginning their service with the Bureau of Reclamation are encouraged not only to develop their technical skills, but also to broaden their professional outlook.

Here is an irrigation scene on the Bureau of Reclamation's Columbia Basin Project in the State of Washington. Engineering development of this million-acre multiple-purpose project is being carried out in a spirit of cooperation and friendliness; the Bureau engineers work closely with farmers and other beneficiaries of the project in the building and operation of land and water resource features.

Dean Weil

IN EDUCATION

"The breadth and depth of his own education must be continually increased."

THE importance of the engineering profession in our modern technological world is best exemplified by the status that the public has given the verb, *to engineer*. In effect it means *to carry through to a successful culmination*. When the politician discusses in his caucus who shall carry a project through the legislature, or when at a civic meeting someone is sought who can carry out a particular social objective, it is not uncommon to ask the question, "Whom shall we get to engineer this project?" No other profession has been dignified and complimented in this manner.

In planning engineering education for tomorrow, one must take cognizance of what will be the responsibility of the engineer in the world of tomorrow. While there will always be engineers who will wear hip boots and supervise great construction projects, and others who will work at the drawing board in problems of design, the world today calls upon engineers to do a myriad of tasks far beyond those that were considered engineering yesteryear.

If we assume that the engineer is to be a man who designs equipment and operates it, then I suppose we can have a rather narrow form of education which deals primarily with the application of formulaic knowledge. On the other hand, the present shortage that we now have in the engineering profession is in no small measure due to the fact that persons rise through the drafting room, the design room, and the plant to administrative and executive positions. It is because of this, I believe that the engineering educator of today must face the fact that his responsibility extends beyond the training of personnel for design, construction and operation. The educator must recognize that a large percentage of the persons who complete an engineering curriculum will eventually find their sphere of activity in sales, administration, and countless other fields including insurance, banking, and politics.

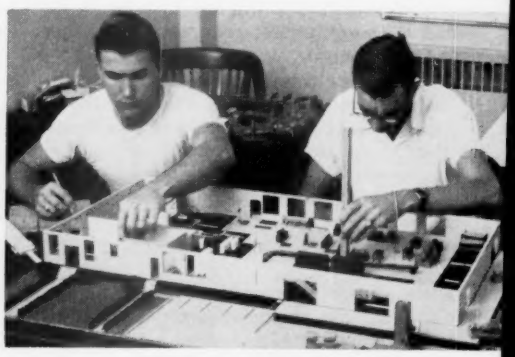
SOME time ago, I wrote in an article that the path of the engineer today was along the following lines. The young man leaving school is probably given as his first assignment one dealing solely with *materials* and *machines*. As he secures experience he finds that he is next called upon to speed up the work and is given additional *men* to carry forth his projects. This means that he must then develop *methods* for the effective use of these assistants. If he succeeds, it is not long before he is taken from this area and devotes his entire time to *management* problems. From here it is but a step to the financial aspect of the enterprise, where the engineer's talents are directed toward decisions about *money*. Thus I suppose we could describe the path of the engineer as increasing skill directed toward increasingly difficult problems, namely, *Materials*, *Machines*, *Men*, *Methods*, *Management* and *Money*.

If then the engineer's training is exclusively in materials and machines, he may find himself inefficient in the handling of the last four aspects of engineering skill.

In some ways the growth of the engineer does not differ too greatly from that which occurs in the other professions. The attorney who is expert in technical matters of law and who is not conversant with other broad fields of knowledge will probably not find himself in the upper strata of his profession. So too in the case of the engineer, it must be recognized that unless he has had a relatively broad training he will have to confine himself to a rather narrow field of technology. It is, I think, this aspect of engineering education that is in the forefront at the present time.

Clearly if we expect a broad education for the student we must expect it even more of the engineering educator. He certainly must be an individual who can keep pace with the times, not only with the scientific and technological aspects but also with the economic, social and political aspects.

Twenty years ago, the catalogues of our best engineer-



In the photo above, engineering students at the University of Florida are studying plant layout. Tomorrow's industrial engineer will be faced with problems of automation, worker efficiency, and the like.

ing schools listed few members of the teaching faculty who had the doctoral degree. In one of the outstanding universities of our country at that time, of about twenty men in the mechanical engineering department, only three had the doctorate, and these three were in the lower teaching ranks. Some of the most prominent men had no academic degrees at all.

Most of our engineering colleges today, however, are mindful of the fact that while practical experience is important, the faculty must be rounded out to include men who have taken advanced academic work in their professional subject matter.

It is interesting to see how this varies among the departments and sometimes even among divisions within a particular department. Thus in the electrical engineering department, in the field of communications a majority of personnel may now have a doctoral degree, but this will probably not be true in the electric power and machinery fields. The chemical engineering department was probably the first to emphasize the advanced degree. In the civil engineering department advanced degrees are prevalent in the sanitary engineering division but not in some of the other areas. In the mechanical engineering field, it is very difficult at the present time to secure men with the Ph.D. qualification for pedagogical work.

In the future there seems to be little doubt that the engineering teaching profession will be practically closed to persons not having the master's degree, and increasingly this will apply also to persons not having the doctorate.

Equivalence in professional attainment can occasionally be substituted for these degrees, but in general the educator of tomorrow will probably have both the degree and other attainments of a practicing professional nature. In most cases, just as the M.D. teaching in a medical school is registered to practice too, so will the engineering teacher be a registered member of his profession.

Unfortunately, men of these qualifications will not be readily available for teaching posts; they will be more and more in demand by industry as we enter further into an era of nuclear developments. To secure these men, universities will have to pay salaries commensurate with their worth, and this may place a severe handicap on engineering colleges, particularly those that are part of campuses dominated by the arts and science colleges and by other colleges.

The current acceleration in new industrial developments, stimulated primarily by the utilization of atomic energy, points to the fact that though specialization is essential for some engineers, for others a broad concept of the field is equally necessary.

The engineer who is called upon to design special equipment to meet conditions never encountered before must have secured so specialized a training that he can design the equipment and yet so broad an education that he can make his knowledge available in connection with the use of new methods and new materials.

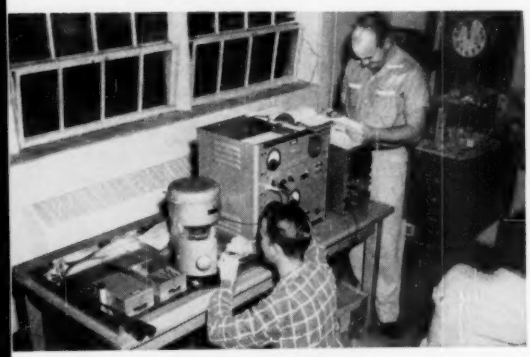
In general, this means that the engineering graduate of the future will have to have a thorough knowledge of fundamentals in the basic engineering sciences. Mastery of his field of specialization will come largely from his experience after graduation. Thus, many of the highly departmentalized programs at universities will have to be replaced by more fundamental and basic engineering science curricula.

As the scope of knowledge which the practicing engineer must possess continues to grow, the engineering educator will find it even more necessary than now to go several steps beyond what he expects his students to learn, and the breadth and depth of his own education must therefore be continually increased—and this applies not only to basic engineering technology but to general knowledge as well.

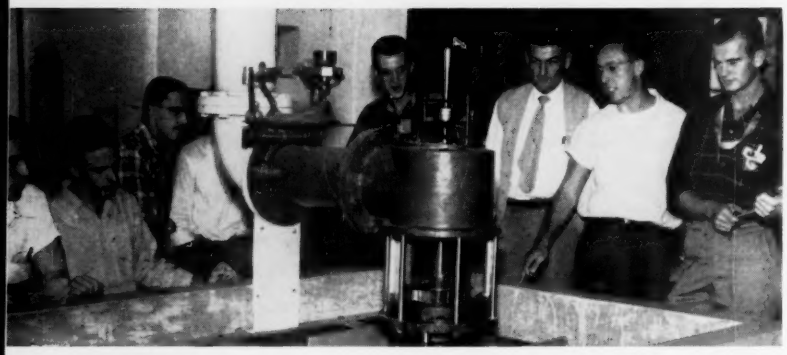
Educators responsible for planning and policy therefore find themselves in this quandry: Shall the engineering school teach solely those men who will enter, and stay in, the advanced technological phases? Or, must the school recognize and accept the fact that a great many persons will enter administrative, management, sales, and other fields that do not require the advanced technical skills? This so-called administrative group even more than other engineers must have a very broad education. This I do not believe can be made available in a four-year undergraduate program to any but exceptional students under the existing conditions of high school preparation.

I am one of those who believe that the situation of inadequate preparation in the high school cannot be corrected in the immediate future. For a long time to come, it will be the job of the engineering teacher—particularly if he teaches engineering freshmen—to communicate his knowledge with patience and pedagogic skill and to assume previous interest, but not previous knowledge in his students.

There can be no question that an American youngster from his earliest comprehension is surrounded on every side by things which awaken in him an interest in science and engineering. Most of his toys will be of a mechanical nature. When he listens to the radio or views television, the probability is that he will run into some interesting program about science. His recreational reading will probably be science fiction. Thus, by the time the youngster is fourteen years of age, he certainly must



These engineers of tomorrow at the University of Florida are learning about electronic and radioactive measuring tools as these devices will be used more and more in future years.



Basic studies in heat transmission, fluid flow and other fundamental areas will probably be increasingly emphasized in engineering education.

have enthusiasm for the wonderful world of science.

Then he enters high school. He is forced to take subject matter in the field of science and mathematics under such conditions that eventually he detests these subjects. Frequently, therefore, the student feels that he is not capable of handling scientific and mathematical subject matter and that therefore he will not be an engineer. I frequently ask myself the question: If this student had been subjected to teachers who themselves were enthusiastic about science and mathematics, and if they taught in an inspirational manner, would the same thing have occurred?

Unfortunately, as several surveys in recent years have shown, a large majority of the science and mathematics teachers in high schools are not prepared to teach these subjects. What is even worse, they do not want to teach them, but are practically forced into doing so. In many cases, a coach is hired because of his ability as a coach. Then, in order to fill out his schedule, it is requested that he teach science. The coach frequently does not care to do so, but he must in order to carry a reasonable load.

According to information released by the U.S. Office of Education, half of the nation's high schools offer no physics or chemistry courses at all.

Therefore, under existing conditions, we cannot expect good teaching of the sciences in any but exceptionally favored schools. And insofar as we continue to insist on pre-college preparation in science and mathematics, we are very likely driving out of the science and engineering fields a large number of potentially excellent students.

It is my belief that if the student has deficiencies in mathematics and science, he can make these up during his first year at college. I feel that the time for teaching the subject in college will be shorter than it could have been in high school. This might mean, however, that for a large number of students the undergraduate program would be lengthened to five years.

Would this be very different from what now exists? My impression is that if a study were made, it would be found that in most colleges requiring high standards for graduation, probably not many more than ten per cent of the freshmen who indicate an interest in engineering eventually graduate in four years. The other 90 per cent. I believe, would be found to have left the university, or transferred to other disciplines, or have taken more than four years to graduate with an engineering degree.

In our rural areas, a large number of persons—probably far more than we realize—could never enter college under restrictive entrance requirements. Yet their intelligence may be very high and if given the opportunity to make up the subject matter that they could not properly secure in the high schools, these men may later become some of the leaders in our engineering profession.

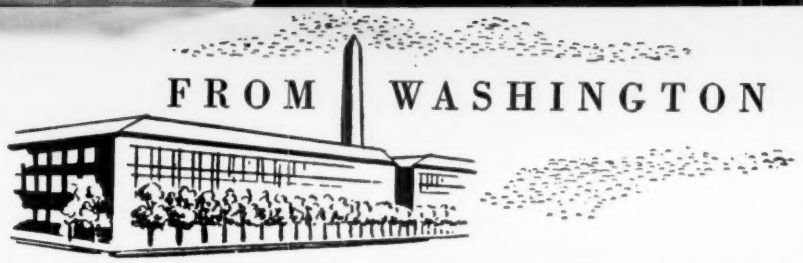
It is quite possible therefore that in the future the five-year undergraduate program will be placed in effect not in order to introduce higher level subjects, but it will be based upon the circumstantially limited education of our entering students. Those students who by examination show that they can graduate in four years will be permitted to try. And with good teaching by inspirational professional engineers they can succeed. This, to me, appears to be a very definite trend in the immediately foreseeable future.

Twenty years from now Mr. John Public will expect much more of the engineer than he does today.

Twenty years ago the engineer seldom was found in politics or in the public and social life of the community. Today we are in a transition period, and there is an increasing expectation that the engineer will do more than create, that he will take leadership so that his "brain children" will not be diverted from the public good.

Just as the attorney frequently is considered as a *counselor*, so will the engineer of the future be considered as an *administrator*.

This places upon the engineering educator of the future a responsibility to meet the new challenge in his training of men for the profession. As the educator in the past has kept up with change and growth, so will the educator of tomorrow.—***End.***



By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

MILITARY TRAINING PROVISIONS FOR ENGINEERS AND SCIENTISTS SET IN MOTION

TWO Executive Orders have been issued by President Eisenhower which establish the procedures to implement the provisions of the Reserve Forces Act of 1955 to permit engineers, scientists and other persons in critical occupations to discharge their military obligation by a reduced term of active military service.

The basic legislation, adopted in August, 1955, provides that the special categories may volunteer for six months of active duty training, without regard to the age limitation of 18½ applicable to others, to be followed by 7½ years in the reserve. The reserve service for those in critical categories may, however, all be in the Standby Reserve. The Standby group will be subject to recall to active duty only after a determination of availability by the Selective Service System and only if Congress declares a national emergency.

In a statement accompanying the Executive Orders, the President said that they "provide for the optimum use of young men of military age in relation to the critical needs of the defense-supporting economy now and in a mobilization, and they will assure that the Ready Reserve will be immediately available with minimum attrition in the event of mobilization." The President added that the White House action was "responsive to the concern of the President and the Congress that the manpower needs of the Armed Forces be met, with due consideration of the urgent needs of the industries and scientific laboratories which are critically necessary for the support of the defense effort."

The critical skill program will be handled through the Selective Service System. A registrant who believes he has a critical skill which is being utilized in a critical defense-supporting industry or a research activity affecting national defense may file a written request with his local Selective Service Board to be selected for enlistment in the program. The local board will then suspend all action in his case except consideration of his request. A registrant, to be eligible to file such a request, must be in Class 1-A with no appeal pending. The local board will refer the application to the appropriate State Advisory Committee on Scientific Engineering, and Specialized Personnel for recommendation, and will act on the application after receiving the advice. The registrant and his employer will be advised of the local board's decision and an appeal may be taken to the appeal board and to the President if the decision is unfavorable. Those selected for the program must enlist in the proper unit of the Ready Reserve within 30 days after notification of selection has been mailed and will thereafter be called to active duty training for the prescribed period, which may be from 3 to 6 months.

It is important to note that two criteria must be met to qualify for the special program. First, the registrant must be in an occupation listed in the current list of critical occupations issued by the Secretary of Labor. This poses no problem for professional engineers as "Engineer-Professional (All Branches)" is on the list. Other listed occupations in the engineering-scientific field are: Chemist; Engineer Draftsman, Design; Geologist; Geophysicist; Mathematician; Microbiologist; Physicist; Teacher, College and Vocational (critical occupations only); Teacher, High School (Mathematics and Physical and Biological Sciences Only); and Tool and Die Designer.

A registrant under the Reserve Forces Act must have had a satisfactory academic record.

The second requirement is that the registrant's critical skill is being utilized in a critical defense-supporting industry or in a research activity affecting national defense. The following list of activities in this category was recently published by the Office of Defense Mobilization after consultation with the Secretary of Defense and the Interdepartmental Manpower Policy Committee:

(Please turn the page)

ACTIVITIES

1. *PRODUCTION AND MAINTENANCE OF AIRCRAFT AND PARTS*

   Production, maintenance, and repair of military aircraft and component parts.

2. *SHIP AND BOAT ENGINEERING*

   Engineering and design of ships and boats and their components for military purposes.

3. *ORDNANCE*

   Production and maintenance of weapons (including nuclear weapons and guided missiles) and component parts.

4. *PRECISION LABORATORY INSTRUMENTS, APPARATUS, AND SCIENTIFIC LABORATORY GLASSWARE*

   Production of complex or custom blown scientific and technical and laboratory glassware. Production of precision laboratory instruments such as analytical balances, centrifuges, spectrographs, spectrophotometers, microtomes, pH instruments, galvanometers, potentiometric devices, etc.

5. *PRODUCTION OF ELECTRONIC AND COMMUNICATION EQUIPMENT*

   Production of electronic and communication equipment for military use.

6. *PRODUCTION OF CHEMICAL AND ALLIED PRODUCTS*

   Production of materials specifically used in propellants for launched or guided missiles, aircraft, armament rockets, and similar weapons, as well as the processing of the materials into propellants, exclusive of conventional fuels. Production of high temperature resins and other chemicals used specifically in the production of launched or guided missiles, aircraft, armament rockets, and similar weapons.

7. *WATER AND SEWERAGE SYSTEMS*

   Operation of water and sewerage systems.

8. *HEALTH AND WELFARE SERVICES*

   Personal medical, dental and nursing services; hospitals; public health services.

9. *EDUCATIONAL SERVICES*

   Colleges and vocational schools and high school instruction in mathematics and physical and biological sciences.

10. *RESEARCH AND DEVELOPMENT SERVICES*

    Basic and applied research, exploration and development projects, including process development, of direct concern to the national health, safety, or interest.

The applications are to be accompanied by the following information:

(1) A certificate of the registrant and his employer that the registrant has a critical skill which is being utilized in a critical defense-supporting industry or in a research activity affecting national defense.

(2) Evidence that the registrant has demonstrated by his academic record or record of employment, or both, that he has the capacity for and gives promise of performing the duties of the occupation requiring such critical skill with a high degree of competence, productivity, or creativity.

(3) A written statement of the registrant that after completion of his prescribed period of active duty for training he intends to return to his former employment or to enter employment in a critical defense-supporting industry or in a research activity affecting national defense utilizing his critical skill.

After completion of the active duty for training, the registrant is required to keep his local board informed concerning his mailing address, occupation, and employment, and report to the local board in writing every change in his mailing address, occupation, or employment within 10 days after any such changes occur. Those who are transferred to the Standby Reserve after the active duty training and who cease to be employed in a critical defense-supporting industry or research activity will be subject to transfer to the Ready Reserve and required to participate in reserve training programs.

The screening procedure prescribes that those in the critical categories described above may be transferred to the Standby Reserve if in excess of the numbers required by the Ready Reserve for such skills. However, a person with a critical military skill may be retained in the Ready Reserve.

The detailed procedures spelled out in the Executive Orders appear to follow closely the spirit expressed by Assistant Secretary of Defense Carter L. Burgess in attempting to develop a program which will recognize the unique nature of engineers and scientists in national defense planning; without, at the same time, granting blanket coverage to a special group for special consideration. It has been recognized throughout in the Pentagon's planning that the special consideration for engineers, scientists and others must be reasonably related to a special contribution to the national defense on an individual basis. Otherwise, it has been feared, Congress and the public would react unfavorably toward such a separate program.

Although the over-all six-month program has gotten off to a slow start, the House Armed Services Committee has adopted a "hands off" policy for the balance of this fiscal year, ending June 30, 1956. At that time the program will be reviewed, and in considering whether the law requires amendment the Congressional group will undoubtedly study the implementation of the special engineer-scientist provisions with respect to Selective Service administration, the operation of the advisory boards and the numbers of engineers, scientists and others who volunteer for the special program.

American Association for Advancement of Science Invites NSPE Members

In the near future, each member of the National Society of Professional Engineers will receive a personal letter inviting him to join the American Association for the Advancement of Science on an individual basis.

NSPE has recently become an affiliate of the AAAS and is now represented on the Association's Council. The National Society will thus be eligible to participate in AAAS national and regional meetings and to join in sponsoring programs of particular interest in line with its professional concerns.

Because of NSPE's affiliation with the Association, all NSPE members are now eligible to apply for individual AAAS membership. Annual AAAS dues for those who wish to join under this arrangement are $6.50, and this fee also covers a subscription to one of the two regular AAAS publications, according to the choice of the member. These publications are *Science* (weekly) and *The Scientific Monthly*, and the regular subscription rate at which they are offered is $7.50. Members can receive both publications by paying an annual fee of $10, which also covers their dues.

Other advantages of individual membership will be detailed in the AAAS letter to each NSPE member and in an explanatory pamphlet which will also be sent to the P.E.'s.

The American Association for the Advancement of Science is a 108-year-old organization established to further the work of scientists, facilitate cooperation among them, improve the effectiveness of the application of science for the benefit of mankind, and increase the public understanding of science and its application in human progress.

FCC Adopts NSPE Request

The Federal Communications Commission had adopted a Hearing Manual to promote uniformity in Commission proceedings which incorporates a recognition of professional engineers at the request of NSPE.

The original draft of the manual said that studio and transmitter building costs of construction, based upon blueprints and specifications could be submitted by contractors, architects or other qualified persons. NSPE submitted comments to the FCC proposing that "professional engineer" be added to the list of those eligible to submit such documents.

Can You Call a Man a "Failure" at Thirty?

Men who think that success is only a matter of "a few years" are failures . . . however young they are!

How often have you heard some young man in business say, "I'll admit the job I have now isn't much but, after all, I'm only in my twenties."

Or: "Just about every executive in the company I work for is between 45 and 65. I have plenty of time to get ahead."

This *mistaken* idea that success comes automatically with time is easy to understand. Promotions do come regularly and effortlessly to young men of promise. *But* the day arrives, often abruptly, when that promise must be *fulfilled*. Native ability and intelligence can carry a man only to the midway point in business—beyond that he must *prove* his capacity to justify a position of executive responsibility. That calls for a practical, working knowledge of business fundamentals.

The time to build that knowledge—to lay a solid groundwork for your future progress—is now . . . *now* while time is still on your side. If you fail to recognize that fact, you'll know only struggling, skimping and regret when your earning power should be at its height.

FOR THE BUSINESS MAN WHO REFUSES TO STAGNATE

HALF the world is half asleep! Men who could be making twice their present salaries are coasting along, hoping for promotions but doing nothing to bring themselves forcefully to the attention of management. They're wasting the most fruitful years of their business lives . . . throwing away thousands of dollars they'll never be able to make up.

If *you* want to discover how to start to succeed while you're still young—if you want to avoid the heartbreak of failure in later years—send today for "Forging Ahead in Business" . . . one of the most practical and helpful booklets ever written on the problems of personal advancement. You will discover what the qualifications of an executive are in today's competitive market . . . what you must know to make $15,000, $20,000 or more a year . . . what you must *do* to accumulate this knowledge.

"Forging Ahead in Business" was written for ambitious men who seriously want to get down to bed-rock in their thinking about their business future; there's no charge for the booklet because, frankly, we've never been able to set a price on it that would reflect its true value. Some men have found a fortune in its pages. If you feel that it's meant for you, simply fill out and return this coupon. Your complimentary copy will be mailed to you promptly.

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A LISTING OF THE STATE BOARDS

For the convenience of our readers, we are listing below the names and addresses of the various State Registration Boards. It is suggested that this issue of the American Engineer be filed for future use.

Alabama State Board of Registration for Professional Engineers and Land Surveyors
Clifton C. Cobb, Executive Secretary
711 High Street, Montgomery, Alabama

Alaska Territorial Board of Engineers and Architects Examiners
Leo H. Saarela, Secretary
Box 854, Anchorage, Alaska

Arizona State Board of Technical Registration
Mrs. Rayma Neeb, Executive Secretary
Room 302, 128 N. 1st Ave.,
Phoenix, Arizona

Arkansas State Board of Registration for Professional Engineers
V. E. Scott, Secretary-Treasurer
P. O. Box 175, Pulaski Heights Station,
Little Rock, Arkansas

California State Board of Registration for Civil and Professional Engineers
W. A. White Executive Secretary
Room 529, Business & Professions
Bldg., 1020 N. St.,
Sacramento 14, California

Colorado State Board of Registration for Professional Engineers
J. Harold Bailey, Asst. Secretary
20 Capitol Building, Denver, Colorado

Connecticut State Board of Registration for Professional Engineers and Land Surveyors
William K. Simpson, Secretary
30 Oak Street, Hartford 6, Connecticut

Delaware State Board of Registration for Professional Engineers and Land Surveyors
Frank T. Lynch, Secretary
311 W. 12th St., Wilmington, Delaware

District of Columbia Board of Registration For Professional Engineers
Mrs. Lacey W. Coad, Asst. Secretary
1740 Massachusetts Ave., N. W.
Washington 6, D. C.

Florida State Board of Engineer Examiners
Mrs. Ann P. Clover, Executive Secretary
408 John F. Seagle Building,
Gainesville, Florida

Georgia State Board of Registration for Professional Engineers and Land Surveyors
R. C. Coleman, Joint Secretary
111 State Capitol, Atlanta, Georgia

Hawaii Board of Registration for Professional Engineers, Architects and Land Surveyors
Wm. C. Furer, Assistant Secretary
1909 Aleo Place, Honolulu 14, Hawaii

Idaho State Board of Engineering Examiners
Orland C. Mayer, Secretary
623½ Main Street, Boise, Idaho

Illinois Department of Registration and Education, Professional Engineers' Examining Committee
Francis E. Andrews, Secretary
Commonwealth Edison Co.
72 W. Adams St., Chicago 90, Illinois

Indiana State Board of Registration for Professional Engineers and Land Surveyors
Ferdinand Jehle, Secretary
230 State House, Indianapolis, Indiana

Iowa State Board of Engineering Examiners
W. G. Cunningham, Secretary
State House, Des Moines 19, Iowa

Kansas State Board of Engineering Examiners
Mrs. Della Sterrett, Executive Secretary
422 Garlinghouse Bldg., Topeka, Kansas

Kentucky State Board of Registration for Professional Engineers
C. S. Crouse, Secretary-Treasurer
University of Kentucky,
Lexington 29, Kentucky

Louisiana State Board of Registration for Professional Engineers and Land Surveyors
F. W. Macdonald, Executive Secretary
Room 233, Civil Engineering Building
Tulane University
New Orleans 18, Louisiana

Maine State Board of Registration for Professional Engineers
Bryant L. Hopkins, Secretary
Box 103, Waterville, Maine

Maryland State Board of Registration for Professional Engineers and Land Surveyors
J. W. Gore, Secretary
1101 Key Highway,
Baltimore 30, Maryland

Massachusetts State Board of Registration for Professional Engineers and of Land Surveyors
Mrs. Gertrude J. Cammon, Secretary
to Board, Room 34, State House
Boston, Massachusetts

Michigan State Board of Registration for Architects, Professional Engineers and Land Surveyors
Henry G. Groehn, Executive Secretary
1604 Cadillac Square Building
Detroit 26, Michigan

Minnesota State Board of Registration for Architects, Engineers and Land Surveyors
Miss Helen D. Carlson, Executive Secretary
316 New York Building
St. Paul 1, Minnesota

Mississippi State Board of Registration for Professional Engineers
O. B. Curtis, Sr., Secretary
P. O. Box 3, Jackson, Mississippi

Missouri State Board of Registration for Architects and Professional Engineers
Mrs. Clemmie V. Wall, Secretary
Box 184, Jefferson City, Missouri

Montana State Board of Registration for Civil Engineers and Land Surveyors
E. R. Dodge, Secretary
c/o Civil Engrg. Dept., Montana State
College, Bozeman, Montana

Nebraska State Board of Examiners for Professional Engineers and Architects
Roy M. Green, Secretary
210 Ferguson Hall,
University of Nebraska
Lincoln 8, Nebraska

Nevada State Board of Registered Professional Engineers
Stanley G. Palmer, Secretary
c/o College of Engineering, University
of Nevada, Reno, Nevada

New Hampshire State Board of Registration for Professional Engineers
Henry T. Spear, Secretary
P. O. Box 235, Laconia, New Hampshire

New Jersey State Board of Professional Engineers and Land Surveyors
Thomas E. Heathcote, Secretary-Director, 921 Bergen Avenue
Jersey City 6, New Jersey

New Mexico State Board of Registration for Professional Engineers and Land Surveyors
S. E. Reynolds, Secretary
P. O. Box 1079, Santa Fe, New Mexico

New York State Board of Examiners of Professional Engineers and Land Surveyors
Newell L. Freeman, Secretary
c/o New York State Education Dept.
23 South Pearl Street,
Albany 7, New York

North Carolina State Board of Registration for Professional Engineers and Land Surveyors
Robert B. Rice, Secretary
P. O. Box 5131, N. C. State College
Raleigh, North Carolina

North Dakota State Board of Registration for Professional Engineers
A. L. Bavone, Secretary
P. O. Box 1265, Minot, North Dakota

Ohio State Board of Registration for Professional Engineers and Surveyors
Robert N. Wald, Secretary
21 West Broad Street
Columbus 15, Ohio

Oklahoma State Board of Registration for Professional Engineers
Gwynne B. Hill, Secretary
2901 Classen Blvd., 225 Cameron
Building, Oklahoma City, Oklahoma

Oregon State Board of Engineering Examiners
E. A. Buckhorn, Secretary
717 Board of Trade Building
Portland 4, Oregon

Pennsylvania State Registration Board for Professional Engineers
Miss Rebecca J. Nickles, Secretary
324 Education Building,
Harrisburg, Pennsylvania

Puerto Rico Board of Examiners of Engineers, Architects and Surveyors
Joaquin Mercado-Cruz,
Secretary-Treasurer
P. O. Box 3271, San Juan, Puerto Rico

Rhode Island State Board of Registration for Professional Engineers and Land Surveyors
Philip S. Mancini, Secretary
246 State Office Building,
Providence, Rhode Island

South Carolina State Board of Engineering Examiners
T. Keith Legaré, Secretary
P. O. Drawer 1404
Columbia, South Carolina

South Dakota State Board of Engineering and Architectural Examiners
E. D. Dake, Secretary
S. D. School of Mines and Technology,
Rapid City, South Dakota

Tennessee State Board of Architectural and Engineering Examiners
Granbery Jackson, Jr., Secretary-Treasurer
503 Nashville Trust Building
Nashville, Tennessee

Texas State Board of Registration for Professional Engineers
Carl L. Svensen, Executive Secretary
308 W. 15th St., Austin 1, Texas

Utah Professional Engineers and Land Surveyors Examining Committee, Dept. of Business Regulation
Frank E. Lees, Director
324 State Capitol Building,
Salt Lake City, Utah

Vermont State Board of Registration for Professional Engineers
Walter D. Emerson, Secretary
Norwich University
Northfield, Vermont

Virginia State Board for the Examination and Certification of Professional Engineers, Architects and Land Surveyors
Turner N. Burton, Secretary
P. O. Box 1-X, Richmond, Virginia

Washington State Board of Engineering Examiners
Edw. C. Dohm, Secretary
Department of Licenses, Professional
Division, Transportation Bldg.
Olympia, Washington

West Virginia State Registration Board for Professional Engineers
Robert Williamson, Jr., Secretary
301 Morrison Building
Charleston, West Virginia

Wisconsin State Registration Board of Architects and Professional Engineers
W. A. Piper, Secretary
1140 State Office Bldg.,
Madison 2, Wisconsin

Wyoming State Board of Examining Engineers
Mrs. Wilma H. Lang, Assistant Secretary
201 State Capitol Building
Cheyenne, Wyoming

PROFESSIONAL ENGINEERS' Buyers Guide

The listed concerns are sufficiently interested in Registered Professional Engineers to advertise in your professional magazine or to request a listing in this Guide. They offer products of special interest to RPE's when buying or specifying. For convenience, Building Materials are listed first followed by products under a General Classification. Keep this Guide for future reference.

BUILDING MATERIALS

BATHROOM EQUIPMENT

Norman Boosey Mfg. Co.
5281 Avery Ave.
Detroit 8, Mich.
See advertisement page 6

The Walter S. Kraus Co.
48-02 43rd St.
Woodside 77, N. Y.

Wasco Products, Inc.
Bay State Rd.
Cambridge 38, Mass.

CAULKING AND SEALING

A. C. Horn Co., Inc.
10th St. and 44th Ave.
Long Island City 1, N. Y.

CEILINGS—RADIANT ACOUSTICAL

Burgess-Manning Co.
Architectural Products Div.
Libertyville, Ill.

CEMENT

Burgess-Manning Co.
Architectural Products Div.
Libertyville, Ill.

CONCRETE PRECAST

Texcrete Structural Products Co.
400 First National Bank Bldg.
Dallas 2, Tex.

CONCRETE PRESTRESSED

Texcrete Structural Products Co.
400 First National Bank Bldg.
Dallas 2, Tex.

Wilson Concrete Co.
Route 5—Hwy. 75 & Avery Rd.
Omaha 7, Neb.

CONCRETE ROOF DECK

Texcrete Structural Products Co.
400 First National Bank Bldg.
Dallas 2, Tex.

CURTAIN WALL PANELS

Seaporcel Metals, Inc.
28-20 Borden Ave.
Long Island City 1, N. Y.

DOORS, GARAGE

Overhead Door Corp.
Hartford City, Ind.

DOORS AND SASHES

Ceco Steel Products Corp.
5601 West 26th St.
Chicago 50, Ill.

FLOOR TILE

Hewitt-Robins, Inc.
666 Glenbrook Rd.
Stamford, Conn.

FLOORING

The Flintkote Co.
Industrial Products Div.
30 Rockefeller Plaza
New York 20, N. Y.

Klemp Metal Grating Corp.
6601 South Melvina Ave.
Chicago 38, Ill.

Master Builders Co.
7016 Euclid Ave.
Cleveland, Ohio

GLASS BLOCKS

Pittsburgh Corning Corp.
One Gateway Center
Pittsburgh 22, Pa.

HEATING PANELS

Continental Radiant Glass Heating Corp.
One East 35th St.
New York 21, N. Y.
See advertisement Cover II

HEATING AND VENTILATING EQUIP.

General Electric Co.
Air Conditioning Div.
5 Lawrence Ave.
Bloomfield, N. J.
See advertisement Back Cover

Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

Airtherm Manufacturing Co.
700 S. Spring
St. Louis 10, Mo.

Bell & Gossett Co.
8200 N. Austin Ave.
Morton Grove, Ill.

HEATING AND VENTILATING EQUIP. (Cont.)

C. A. Dunham Co.
400 West Madison
Chicago 6, Ill.

The Trane Co.
206 Cameron Ave.
La Crosse, Wis.

L. J. Wing Mfg. Co.
Linden, N. J.

INSULATION

General Electric Co.
Chemical & Metallurgical Div.
Pittsfield, Mass.
See advertisement Back Cover

Baldwin-Hill Co.
500 Breunig Ave.
Trenton 2, N. J.

The Philip Carey Mfg. Co.
Cincinnati 15, Ohio

Pittsburgh Corning Corp.
One Gateway Center
Pittsburgh 22, Pa.

Seaporcel Metals, Inc.
28-20 Borden Ave.
Long Island City 1, N. Y.

Stic-Klip Mfg. Co., Inc.
50 Regent St.
Cambridge, Mass.

LIGHTING FIXTURES

Edwin F. Guth Co.
2615 Washington Blvd.
St. Louis 3, Mo.

PAINTS, VARNISHES

Alfred Hague & Co., Inc.
227—34th St.
Brooklyn 32, N. Y.

Preco Chemical Corp.
84 County Court House Rd.
New Hyde Park, N. Y.

PLUMBING FIXTURES

Norman Boosey Mfg. Co.
5281 Avery Ave.
Detroit 8, Mich.
See advertisement page 6

PLUMBING FIXTURES (Cont.)

The Walter S. Kraus Co.
48-02 43rd St.
Woodside 77, N. Y.

J. A. Zurn Mfg. Co.
Erie, Pa.

ROOFING, GUTTERING

Airtherm Mfg. Co.
700 S. Spring
St. Louis 10, Mo.

Ceco Steel Products Corp.
5601 West 26th St.
Chicago 50, Ill.

SCAFFOLDING

Carl T. Johnson, P. E.
197 LaSalle Ave.
Kenmore 17, N. Y.

Morgen Manufacturing Co.
117 West Third
Yankton, S. D.

Safway Steel Products, Inc.
6228 W. State St.
Milwaukee 13, Wis.

SCREENS, VIBRATING

Productive Equipment Corp.
2926 W. Lake St.
Chicago 12, Ill.

SHINGLES

The Philip Carey Mfg. Co.
Cincinnati 15, Ohio

SIDING AND BUILDING PAPERS

The Philip Carey Mfg. Co.
Cincinnati 15, Ohio

SKYLIGHTS, PLASTIC

Wasco Products, Inc.
Bay State Road
Cambridge 38, Mass.

SPECIAL HINGES

The Stanley Works
Pressed Metal Div.
195 Lake St.
New Britain, Conn.

BUILDING MATERIALS

Continued

STAIR TREADS

Klemp Metal Grating Corp.
6601 South Melvina Ave.
Chicago 38, Ill.

STEEL FLOOR ARMOR

Klemp Metal Grating Corp.
6601 So. Melvina Ave.
Chicago 38, Ill.

STEEL, STRUCTURAL

Ceco Steel Products Corp.
5601 West 26th St.
Chicago 50, Ill.

Inland Steel Co.
38 South Dearborn St.
Chicago 3, Ill.

Jones & Laughlin Steel Corp.
3 Gateway Center
Pittsburgh 30, Pa.

United States Steel Corp.
525 William Penn Pl.
Pittsburgh 30, Pa.

WATER HEATERS

Continental Radiant Glass Heating Corp.
One East 35th St.
New York 21, N. Y.
See advertisement Cover II

Bell & Gossett Co.
8200 N. Austin Ave.
Morton Grove, Ill.

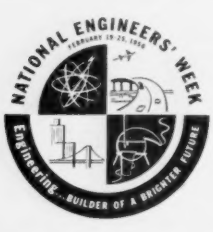
WATERPROOFING MATERIALS

Alfred Hague & Co., Inc.
227—34th St.
Brooklyn 32, N. Y.

Dow Corning Corp.
Midland, Mich.

The Flintkote Co.
Industrial Products Div.
30 Rockefeller Plaza
New York 20, N. Y.

Preco Chemical Corp.
84 County Court House Rd.
New Hyde Park, N. Y.



GENERAL CLASSIFICATIONS

—A—

ABRASIVES

Behr-Manning
3156 Howe St.
Troy, N. Y.

The Carborundum Co.
Niagara Falls, N. Y.

Minnesota Mining & Mfg. Co.
900 Fauquier St.
St. Paul 6, Minn.

Norton Co.
1 New Bond St.
Worcester 6, Mass.

ADDING MACHINES

Rex Rotary Distr. Corp.
387—4th Ave.
New York 16, N. Y.

ADHESIVES

Dow Corning Corp.
Midland, Mich.

Minnesota Mining & Mfg. Co.
900 Fauquier St.
St. Paul 6, Minn.

AERIAL TRAMWAYS

Riblet Tramway Co.
Box 7, St'n. A
Spokane 17, Wash.

AEROSOL (AIR) SAMPLING INSTRUMENTS

Roy A. Martin Co.
809 Wellesley Drive, N.W.
Atlanta, Ga.

AFTER COOLERS

Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

AGRICULTURAL EQUIPMENT

Seaman-Andwall Corp.
305 N. 25th St.
Milwaukee 1, Wisc.

AIR CLEANERS, ELECTRONIC

Trion, Inc.
1000 Island Ave.
McKees Rocks, Pa.

AIR COMPRESSORS

Walter Kidde & Co., Inc.
1298 Main St.
Belleville 9, N. J.

Worthington Corp.
Harrison, N. J.

AIR CONDITIONERS

General Electric Co.
Air Conditioning Div.
5 Lawrence Ave.
Bloomfield, N. J.
See advertisement Back Cover

Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

Radio Corp. of America
Camden, N. J.

AIR CONDITIONERS (Cont.)

The Ready-Power Co.
Power Plant Div.
11231 Freud Ave.
Detroit 14, Mich.

The Trane Co.
206 Cameron Ave.
La Crosse, Wisc.

Worthington Corp.
Harrison, N. J.

AIR DIFFUSERS

Conner Engineering Corp.
Shelter Rock Lane
Danbury, Conn.

AIR RECOVERY (ACTUATED CARBON)

Conner Engineering Corp.
Shelter Rock Lane
Danbury, Conn.

AIRCRAFT ACCESSORIES

AiResearch Mfg. Co., Div.
The Garrett Corp.
9851 Sepulveda Blvd.
Los Angeles 45, Calif.

AIRCRAFT, ENGINES & EQUIPMENT

Fairchild Engine & Airplane Corp.
Hagerstown, Md.
See advertisement page 11

Teleflex, Inc.
123 S. Main St.
North Wales, Pa.

AIRCRAFT GROUND SUPPORT EQUIP.

United Mfg. Co. Div.
The W. L. Maxson Corp.
41 Haig St.
Hamden 14, Conn.

ALARM SYSTEMS

Acme Fire Alarm Co., Inc.
106—7th Ave.
New York 11, N. Y.

Edwards Co., Inc.
Post Road
Norwalk, Conn.

Gems Co.
64 Welles Drive
Newington, Conn.

Jarco Services, Inc.
725 S. Erie
Tulsa 12, Okla.

Walter Kidde & Co., Inc.
1298 Main St.
Belleville 9, N. J.

ALL WHEEL DRIVES

Marmon-Herrington Co., Inc.
1511 W. Washington St.
Indianapolis 7, Ind.

ALUMINUM

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

ALUMINUM (Cont.)

Wolverine Tube Div.
Calumet & Hecla, Inc.
1850 Guardian Bldg.
Detroit 26, Mich.

ANHYDROUS AMMONIA PLANTS

H. Emerson Thomas & Assoc., Inc.
111 Quimby St.
Westfield, N. J.

ARCHITECTS SUPPLIES

Eberhard Faber Pencil Co.
New York—Toronto
See advertisement page 7

Engineering Products
101 Kings Highway
Haddonfield, N. J.
See advertisement page 10

Momar Industries
4323 W. 32nd Street
Chicago 23, Ill.
See advertisement page 51

Perspectograph Corp.
285 Madison Ave.
New York 17, N. Y.
See advertisement page 47

Plan Hold Div.
Air Comfort Co.
5204 Chakemco St.
South Gate, Calif.
See advertisement page 41

Canlen Co.
1239 Monroe Ave.
Wyomissing, Pa.

ARTISTS' SUPPLIES

Eberhard-Faber Pencil Co.
New York—Toronto
See advertisement page 7

ASSEMBLY MACHINES

Aidlings, Inc.
95 Liberty St.
New York 6, N. Y.

AUTOMATIC CLUTCHES

Salsbury Corp.
1161 E. Florence Ave.
Los Angeles 1, Calif.

AUTOMATIC CONTROL PANELS

The Airoyal Co.
6 Church St.
New York 6, N. Y.

Automatic Device Co., Inc.
714 Hillgrove Ave.
Western Springs, Ill.

Automatic Switch Co.
391 Lakeside Ave.
Orange, N. J.

Jarco Services, Inc.
725 S. Erie
Tulsa 12, Okla.

AUTOMATIC DOOR CONTROLS

The Stanley Works
Magic Door Div.
195 Lake St.
New Britain, Conn.

AUTOMATIC TRANSMISSIONS

Salsbury Corp.
1161 E. Florence Ave.
Los Angeles 1, Calif.

AUTOMOBILE ACCESSORIES

General Motors Corp.
General Motors Bldg.
Detroit 2, Mich.
See advertisement Cover III

—B—

BALANCING MACHINES

Gisholt Machine Co.
1245 E. Washington Ave.
Madison 10, Wisc.

BALL BEARINGS

New Departure Div.
General Motors Corp.
Bristol, Conn.
See advertisement Cover III

Dodge Mfg. Corp.
Union St.
Mishawaka, Ind.

SKF Industries, Inc.
Front St. & Erie Ave.
Philadelphia 32, Pa.

BELTING, MACHINERY

Carlyle Rubber Co., Inc.
103 Warren St.
New York 7, N. Y.

BELTING (Cont.)

Republic Rubber Div.
Lee Rubber & Tire Corp.
Youngstown, Ohio

United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.

BLOWERS

Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

Read Standard Corp.
900 Richland Ave.
York, Pa.

Roots-Connersville Blower
900 West Mount St.
Connersville, Ind.

BOILER FEED SYSTEMS

Graver Water Conditioning Co.
216 W. 14th St.
New York 11, N. Y.

BOILERS, ACCESSORIES

Combustion Engineering, Inc.
200 Madison Ave.
New York 16, N. Y.

Erie City Iron Works
1422 East Ave., Erie, Pa.

BOILERS (Cont.)

Orr & Sembower, Inc.
Morgantown Rd.
Reading, Pa.

BOOKS, TECHNICAL, SCIENTIFIC

Manas Publications
4513 Potomac Ave., N. W.
Washington 7, D. C.
See advertisement page 61

The Ronald Press Co.
15 E. 26th St.
New York 10, N. Y.

United Catalog Publishers, Inc.
110 Lafayette St.
New York 13, N. Y.

BOOTHS, ACOUSTIC TELEPHONE

Burgess-Manning Co.
Architectural Products Div.
Libertyville, Ill.

BRIDGE DECKING

Klemp Metal Grating Corp.
6601 S. Melvina Ave.
Chicago 38, Ill.

BROACHES

Shearcut Tool Co.
7045 Darby Ave.
Reseda, Calif.

—C—

CABLE, ELECTRIC

General Electric Co.
Construction Materials Div.
1285 Boston Ave.
Bridgeport 2, Conn.
See advertisement Back Cover

CABLE, MULTI CONDUCTOR

The Ansonia Wire & Cable Co.
63 Main St.
Ansonia, Conn.

CALCULATING MACHINES

International Business Machines Corp.
590 Madison Ave.
New York 22, N. Y.

Marchant Calculators, Inc.
1475 Powell St.
Oakland 8, Calif.

Rex Rotary Distr. Corp.
387—4th Ave.
New York 16, N. Y.

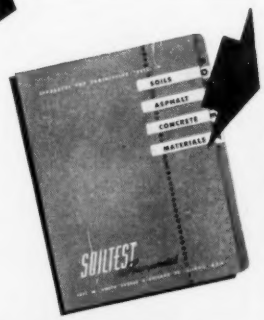
CAMERAS

Eastman Kodak Co.
343 State St.
Rochester 4, N. Y.

Electronic Tube Corp.
1200 E. Mermaid Lane
Philadelphia 18, Pa.

CL-207 LIQUID LIMIT DEVICE

from a SINGLE ITEM to COMPLETE LABORATORIES . . . and MOBILE UNITS for Soils, Concrete and Asphalt testing.



The entire Soiltest line has been created and designed for standard and specialized laboratory and field testing by Soils, Concrete and Bituminous Materials Engineers. Soiltest apparatus is used by more than 2000 Laboratories in over 80 Countries.

NEW CATALOGS AND DESCRIPTIVE BULLETINS ARE AVAILABLE FREE UPON REQUEST

ML-100 MOBILE LABORATORY

SOILTEST Incorporated

WRITE DEPT. O. FOR COMPLETE DETAILS

4711 WEST NORTH AVENUE · CHICAGO 39, ILLINOIS

PROFESSIONAL ENGINEERS' BUYERS GUIDE

CARILLONS, ELECTRIC

Stromberg Carlson Co.
100 Carlson Rd.
Rochester 3, N. Y.
See advertisement page 9

CASTINGS

Zenith Foundry Co.
1501 S. 83rd St.
Milwaukee 14, Wisc.
See advertisement page 45

CATALOG, ELECTRONIC EQUIPMENT

United Catalog Publishers, Inc.
110 Lafayette St.
New York 13, N. Y.

CERAMICS, ELEC. PORCELAIN

The Universal Clay Products Co.
1528 First St.
Sandusky, Ohio

CHAINS, ROLLER, SILENT, CONVEYOR

Whitney Chain Co.
554 Deering Rd., N. W.
Atlanta 9, Ga.

CHAIR LIFTS

Riblet Tramway Co.
Box 7, St'n. A
Spokane 17, Wash.

CHEMICALS, CLEANING

Euthone, Inc.
442 Elm St.
New Haven 11, Conn.

John B. Moore Corp.
Box 3, Peerless Bldg.
Nutley 10, N. J.

CHEMICALS, INDUSTRIAL

The Carborundum Co.
Niagara Falls, N. Y.

The Dow Chemical Co.
Midland, Mich.

United Chemical Corp. of N. M.
P. O. Box 955
Hobbs, N. M.

Wyandotte Chemicals Corp.
Michigan Alkali Div.
Wyandotte, Mich.

CHEMICALS, SEWAGE TREATMENT

The FX-Lab Co.
4 Hill St.
Newark 2, N. J.

Wyandotte Chemicals Corp.
Michigan Alkali Div.
Wyandotte, Mich.

CLEANING EQUIPMENT & CHEMICALS

John B. Moore Corp.
Box 3, Peerless Bldg.
Nutley 10, N. J.

CLUTCHES

Twin Disk Clutch Co.
Racine, Wisc.

COATINGS

Euthone, Inc.
442 Elm St.
New Haven 11, Conn.

The Flintkote Co.
Industrial Products Div.
30 Rockefeller Plaza
New York 20, N. Y.

Alfred Hague & Co., Inc.
227—34th St.
Brooklyn 32, N. Y.

Minnesota Mining & Mfg. Co.
900 Fauquier St.
St. Paul 6, Minn.

COILS, INDUSTRIAL

Thermo-Panel Div.
Dean Products, Inc.
616 Franklin Ave.
Brooklyn 38, N. Y.

COMMERCIAL TRAILERS

Kensington Welding & Trailer Co.
1114 Farmington Ave.
Kensington, Conn.

COMMUNICATIONS EQUIPMENT

Radio Corp. of America
Camden, N. J.

Stromberg Carlson Co.
100 Carlson Rd.
Rochester 3, N. Y.
See advertisement page 9

Allen B. Du Mont Lab., Inc.
750 Bloomfield Ave.
Clifton, N. J.

Edwards Co., Inc.
Post Road
Norwalk, Conn.

Executone, Inc.
415 Lexington Ave.
New York 17, N. Y.

Federal Telephone & Radio Co.
100 Kingsland Rd.
Clifton, N. J.

COMPRESSORS, ROTARY

Fuller Co.
P. O. Box 451
Catasauqua, Pa.

COMPUTERS

Librascope, Inc.
808 Western Ave.
Glendale, Calif.

Marchant Calculators, Inc.
1475 Powell St.
Oakland 8, Calif.

CONCRETE ADDITIVES

A. C. Horn Co., Inc.
10th St. & 44th Ave.
Long Island City 1, N. Y.

Master Builders Co.
7016 Euclid Ave.
Cleveland, Ohio

Preco Chemical Corp.
84 County Court House Rd.
New Hyde Park, N. Y.

CONDENSERS, EVAPORATIVE

Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

CONDUIT, UNDERGROUND

General Electric Co.
Construction Materials Div.
1285 Boston Ave.
Bridgeport 2, Conn.
See advertisement Back Cover

A. M. Byers Co.
Clark Bldg.
Pittsburgh 22, Pa.

Wilson Concrete Co.
Rt. 5—Hwy. 75 & Avery Rd.
Omaha 7, Neb.

CONSULTING ENGINEERS

See Professional Directory pages 56-60

CONTROL EQUIPMENT

General Electric Co.
Apparatus Sales Div.
1 River Rd.
Schenectady 5, N. Y.
See advertisement Back Cover

Acme Electric Corp.
Water Street
Cuba, New York

Automatic Device Co., Inc.
714 Hillgrove Ave.
Western Springs, Ill.

Automatic Switch Co.
391 Lakeside Ave.
Orange, N. J.

The Barber-Coleman Co.
P. O. Drawer 99
Rockford, Ill.

Cutler-Hammer, Inc.
315 N. 12th St.
Milwaukee 1, Wisc.

The Foxboro Co.
Foxboro, Mass.

General Controls Co.
801 Allen Ave.
Glendale 1, Calif.

G. M. Giannini & Co., Inc.
918 E. Green St.
Pasadena, Calif.

Hayden Mfg. Co.
245 E. Elm St.
Torrington, Conn.

Jordan Corp.
6013 Wiehe Rd.
Cincinnati 13, Ohio

Librascope, Inc.
808 Western Ave.
Glendale, Calif.

Teleflex, Inc.
123 S. Main St.
North Wales, Pa.

Zinsco Electrical Prod.
729 Turner St.
Los Angeles 12, Calif.

CONVEYORS

Harry J. Ferguson Co.
149 West Ave.
Jenkintown, Pa.

Fuller Co.
P. O. Box 451
Catasauqua, Pa.

COOLING TOWERS

J. E. Pritchard & Co. of Calif.
4625 Roanoke Pkwy.
Kansas City 12, Mo.

COPPER AND COPPER ALLOYS

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

CORROSION INHIBITORS

A. C. Horn Co., Inc.
10th St. & 44th Ave.
Long Island City 1, N. Y.

Euthone, Inc.
442 Elm St.
New Haven 11, Conn.

John B. Moore Corp.
Box 3, Peerless Bldg.
Nutley 10, N. J.

National Aluminate Corp.
6216 W. 66th Place
Chicago 38, Ill.

COUPLINGS

Thomas Flexible Coupling Co.
Main Ave. & Biddle St.
Warren, Pa.

Whitney Chain Co.
554 Deering Rd., N. W.
Atlanta 9, Ga.

COURSES, TRAINING

Alexander Hamilton Institute
71 W. 23rd Street
New York 10, New York
See advertisement page 33

Geo. E. Deatherage & Son
411—5th Ave. So.
Lake Worth, Fla.
See advertisement page 61

Institute of Scientific Studies
248 Arlington Ave.
Elmhurst, Ill.
See advertisement page 5

John D. Constance, P. E.
625 Hudson Terrace
Cliffside Park, New Jersey

CRANES

Baldwin-Lima-Hamilton Corp.
S. Main St.
Lima, Ohio

Cleveland Tramrail Div.
W. A. York Co.
945 S. 53rd St.
Philadelphia 43, Pa.

Columbus McKinnon Chain Corp.
Fremont Ave.
Tonawanda, N. Y.

CRANES, (Cont.)

R. G. LeTourneau, Inc.
2399 S. MacArthur
Longview, Tex.

Materials Handling Engineers
Atlas Bldg.
Salt Lake City, Utah

Wellman Engineering Co.
7000 Central Ave.
Cleveland 4, Ohio

—D—

D. C. CAPACITORS

Tobe Deutschmann Corp.
921 Providence Hwy.
Norwood, Mass.

DECALCOMANIA

The Meyercord Co.
5323 West Lake St.
Chicago 44, Ill.

DEEP DRAWINGS

The Stanley Works
Pressed Metal Div.
195 Lake St.
New Britain, Conn.

DE-HUMIDIFIERS

Abbeon Supply Co.
179-15 Jamaica Ave.
Jamaica 32, N. Y.

DEHYDRATORS, AIR

Hankison Corp.
P. O. Box 8044B
Pittsburgh 16, Pa.

J. E. Pritchard & Co. of Calif.
4625 Roanoke Pkwy.
Kansas City 12, Mo.

DEPTH RECORDERS

Huston Terra-Marine Co.
P. O. Box 1437
Corpus Christi, Tex.

DIES

General Electric Co.
Carboloy Dept.
11177 E. 8-Mile Rd.
Detroit 32, Mich.
See advertisement Back Cover

DIESEL ENGINES

General Motors Corp.
General Motors Bldg.
Detroit 2, Mich.
See advertisement Cover III

Caterpillar Tractor Co.
Peoria, Ill.

Worthington Corp.
Harrison, N. J.

DOOR OPERATORS, ELECTRIC

Overhead Door Corp.
Hartford City, Ind.

DRAFTING MATERIALS

Eberhard-Faber Pencil Co.
New York—Toronto
See advertisement page 7

Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

Arsco American, Inc.
3308 Edson Ave.
New York 66, N. Y.

Chart-Pak, Inc.
Stamford, Conn.

Frederick Post Co.
3650 N. Avondale Ave.
Chicago 18, Ill.

DRAWING INSTRUMENTS

Perspectograph Corp.
285 Madison Ave.
New York 17, N. Y.
See advertisement page 47

Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

Canlen Co.
1239 Monroe Ave.
Wyomissing, Pa.

National Instrument Co.
2701 Rockwood Ave.
Baltimore 15, Md.

DRAWING STANDS

Arsco American, Inc.
3308 Edson Ave.
New York 66, N. Y.

DRILLS, ELECTRIC

Black & Decker Mfg. Co.
Towson 4, Md.

DRIVES, ADJUSTABLE—SPEED

Reliance Electric & Engineering Co.
1088 Ivanhoe Rd.
Cleveland 10, Ohio

DUPLICATORS

Copease Corp.
270 Park Ave.
New York 17, N. Y.
See advertisement page 4

Cormac Industries, Inc.
80 Fifth Ave.
New York 11, N. Y.

Ozalid Division
General Aniline & Film
347 Ozaway
Johnson City, N. Y.

DUST CLEANING EQUIP.

Flexaust Co.
100 Park Ave.
New York 17, N. Y.

DUST COLLECTORS

G. A. Kleissler Co.
126 Gotthart St.
Newark 5, N. J.

National Eng. Co.
549 W. Washington
Chicago 6, Ill.

DUST MASKS

General Scientific Equip. Co.
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—E—

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Plainville, Conn.
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Milwaukee 1, Wisc.

Mutual Boiler & Mach. Ins. Co.
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The Universal Clay Products Co.
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Sandusky, Ohio

Zinsco Electrical Prod.
729 Turner St.
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Eaton Mfg. Co.
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St. Charles, Ill.

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750 Bloomfield Ave.
Clifton, N. J.

Electronic Engr. Co.
362 W. Bowery St.
Akron 7, Ohio

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New York 17, N. Y.

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Beckman Instruments, Inc.
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Richmond, Calif.

Texas Instruments, Inc.
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Dallas 9, Tex.

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Rotary Lift Co.
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Memphis 2, Tenn.

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Allmetal Screw Products Co.
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Garden City, N. Y.

Heli-Coil Corp.
Danbury, Conn.

Stic-Klip Mfg. Co., Inc.
50 Regent St.
Cambridge, Mass.

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Tennefos Mfg. Co.
116—18th St., No.
Moorhead, Minn.

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Huston Terra-Marine Co.
P. O. Box 1437
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251 E. Park Dr.
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FILTERS, (Cont.)

Cuno Engineering Corp.
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Hankison Corp.
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68 S. Vine St.
Meriden, Conn.

Infilco, Inc.
901 S. Campbell
Tucson, Ariz.

Marvel Engineering Co.
7227 N. Hamlin Ave.
Chicago 45, Ill.

Modern Swimming Pool Co., Inc.
1 Holland Ave.
White Plains, N. Y.

Sparkler Mfg. Co.
169 N. Lake St.
Mundelein, Ill.

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Box 203
Port Washington, N. Y.

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Walter Kidde & Co., Inc.
1298 Main St.
Belleville 9, N. J.

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Mine Safety Appliances Co.
201 N. Braddock Ave.
Pittsburgh 8, Pa.

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F. J. Morse & Co., Inc.
127 E. Ninth St.
St. Paul 1, Minn.

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Gems Co.
64 Welles Dr.
Newington, Conn.

Fluid Drive Engineering Co.
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Salt Lake City, Utah

FUEL OIL ADDITIVES

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P. O. Box 66
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Mt. Vernon, N. Y.

FURNACES, ENCLOSURES

Bigelow-Liptak Corp.
2550 W. Grand Blvd.
Detroit 8, Mich.

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GAS BURNERS

Iron Fireman Mfg. Co.
3170 W. 106th St.
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GASOLINE

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Gulf Refining Co.
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Gulf Refining Co.
1822 Gulf Bldg.
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666 Glenbrook Rd.
Stamford, Conn.

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Lee Rubber & Tire Corp.
Youngstown, Ohio

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New York 17, N. Y.

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New York 17, N. Y.

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Roller Gear Div.
P. O. Box 5841
St. Louis 21, Mo.

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918 E. Green St.
Pasadena, Calif.

Leeds & Northrup Co.
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Mine Safety Appliances Co.
201 N. Braddock Ave.
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100 Kingsland Road
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International Instruments, Inc.
P. O. Box 2954
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Roy A. Martin Co.
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Kern Instruments, Inc.
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The Thom Wood Co.
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Harry J. Ferguson Co.
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Lewis-Shepard Products,
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M-H Standard Co.
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Memphis 2, Tenn.

The Stanley Works
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Jarco Services, Inc.
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Tulsa 12, Okla.

Leeds & Northrup Co.
4970 Stenton Ave.
Philadelphia 44, Pa.

Leupold & Stevens Instruments, Inc.
4445 N. E. Glisan St.
Portland 13, Ore.

National Instrument Co.
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Roots-Connersville Blower
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PIPE, CONCRETE PRESSURE
Price Bro. Co.
P.O. Box 825
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PIPE FITTINGS & FLANGES, WELDING
Tube Turns Div.
National Cylinder Gas Co.
224 E. Broadway
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PIPE, IRON
A. M. Byers Co.
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Eaton Mfg. Co.
3307 - 14th Ave.
Kenosha, Wisc.

Fluid Drive Engineering Co.
3105 E. Cheltenham Pl.
Chicago 49, Ill.

Twin Disk Clutch Co.
Racine, Wisc.

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Troy, N. Y.

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Mutual Boiler & Mach. Ins. Co.
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PROTECTIVE SPECTACLES
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Kansas City 6, Mo.

PUBLIC ADDRESS EQUIPMENT
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St. Charles, Ill.

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6 Church St.
New York 6, N. Y.

American Engr. Co.
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Philadelphia 25, Pa.

Bell & Gossett Co.
8200 N. Austin Ave.
Morton Grove, Ill.

Chempump Corp.
1300 E. Mermaid Lane
Philadelphia 18, Pa.

Decatur Pump Co.
2750 Nelson Park Rd.
Decatur, Ill.

C. A. Dunham Co.
400 W. Madison
Chicago 6, Ill.

The F. W. Myers & Bro. Co.
947 S. Orange St.
Ashland, Ohio

Read Standard Corp.
900 Richland Ave.
York, Pa.

Roots-Connersville Blower
900 W. Mount St.
Connersville, Ind.

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RADAR EQUIPMENT
Huston Terra-Marine Co.
P. O. Box 1437
Corpus Christi, Tex.

Lewis & Kaufman, Ltd.
17320 El Rancho Ave.
P. O. Box 337
Los Gatos, Calif.

Texas Instruments, Inc.
6000 Lemmon Ave.
Dallas 9, Tex.

RADIATORS
Burgess-Manning Co.
Architectural Products Div.
Libertyville, Ill.

Thermo-Panel Div.
Dean Products, Inc.
616 Franklin Ave.
Brooklyn 38, N. Y.

RADIO APPARATUS
Stromberg Carlson Co.
100 Carlson Road
Rochester 3, N. Y.
See advertisement page 9

RADIO EQUIPMENT
General Electric Co.
Electronics Div.
Electronics Park
Syracuse, N. Y.
See advertisement Back Cover

Kahn Associates
1141 President St.
Brooklyn 25, N. Y.

RADIO PARTS
Federal Telephone & Radio Co.
100 Kingsland Road
Clifton, N. J.

Lewis & Kaufman, Ltd.
17320 El Rancho Ave.
P. O. Box 337
Los Gatos, Calif.

RAILWAY EQUIPMENT
Federal Telephone & Radio Co.
100 Kingsland Road
Clifton, N. J.

Wellman Engr. Co.
7000 Central Ave.
Cleveland 4, Ohio

REAMERS
Shearcut Tool Co.
7045 Darby Ave.
Reseda, Calif.

RECTIFIERS, POWER
Federal Telephone & Radio Co.
100 Kingsland Rd.
Clifton, N. J.

Kepco Laboratories
131-38 Sanford Ave.
Flushing 54, N. Y.

REFRACTORIES
The Carborundum Co.
Niagara Falls, N. Y.

REFRIGERATION EQUIPMENT
Niagara Blower Co.
405 Lexington Ave.
New York 17, N. Y.
See advertisement page 8

The Ready-Power Co.
Power Plant Div.
11231 Freud Ave.
Detroit 14, Mich.

The Trane Co.
206 Cameron Ave.
LaCrosse, Wisc.

REGULATORS, PRESSURE & TEMP.
Automatic Devices Co., Inc.
714 Hillgrove Ave.
Western Springs, Ill.

The Barber-Colman Co.
P.O. Drawer 99
Rockford, Ill.

Jordan Corp.
6013 Wiehe Rd.
Cincinnati 13, Ohio

REGULATORS, VOLTAGE
Kepco Laboratories
131-38 Sanford Ave.
Flushing 54, N. Y.

REINFORCEMENT, WIRE FABRIC
Wire Reinforcement Institute, Inc.
1049 National Press Bulg.
Washington 4, D. C.

RELAYS
Ohmite Mfg. Co.
3601 Howard St.
Skokie, Ill.

REPRODUCTION MACH. & MATERIALS
Copease Corp.
270 Park Ave.
New York 17, N. Y.
See advertisement page 4

Ozalid Div.
Gen. Aniline & Film Corp.
347 Ozaway
Johnson City, N. Y.

Frederick Post Co.
3650 N. Avondale Ave.
Chicago 18, Ill.

RESISTORS
Dale Products, Inc.
P. O. Box 136
Columbus, Nebr.

Ohmite Mfg. Co.
3601 Howard St.
Skokie, Ill.

ROAD BUILDING EQUIPMENT
Seaman-Andwall Corp.
305 N. 25th St.
Milwaukee 1, Wisc.

ROLLER BEARINGS
New Departure Div.
General Motors Corp.
Bristol, Conn.
See advertisement Cover III

ROLLER BEARINGS (Cont.)
Dodge Mfg. Corp.
Union St.
Mishawaka, Ind.

SKF Industries, Inc.
Front St. & Erie Ave.
Philadelphia 32, Pa.

ROLLING MILLS
Stanat Mfg. Co., Inc.
4725 37th St.
Long Island City 1, N. Y.

ROTAMETERS
Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

—S—

SAFETY DEVICES (DOORS)
The Stanley Works
Magic Door Div.
195 Lake St.
New Britain, Conn.

SAFETY EQUIPMENT
General Scientific Equip. Co.
27th & Huntingdon Sts.
P. O. Box 6798
Philadelphia 32, Pa.

Mine Safety Appliances Co.
201 N. Braddock Ave.
Pittsburgh 8, Pa.

United States Safety Service Co.
1215 McGee St.
Kansas City 6, Mo.

SAFETY SWITCHES
General Electric Co.
Trumbull Components Dept.
Plainville, Conn.
See advertisement Back Cover

SAWS
Black & Decker Mfg. Co.
Towson 4, Md.

Doall Co.
254 N. Laurel Ave.
Chicago 26, Ill.

SCALE INHIBITORS
United Chemical Corp. of N. M.
P. O. Box 955
Hobbs, N. M.

SCALES
Soiltest, Inc.
4711 W. North Ave.
Chicago 39, Ill.
See advertisement page 37

The Howe Scale Co., Inc.
Rutland, Vt.

Streeter-Amet Co.
4101 N. Ravenswood Ave.
Chicago 13, Ill.

SCIENTIFIC INSTRUMENTS
Soiltest, Inc.
4711 W. North Ave.
Chicago 39, Ill.
See advertisement page 37

SCIENTIFIC INST. (Cont.)
American Paulin System
1524 So. Flower St.
Los Angeles 15, Calif.

Streeter-Amet Co.
4101 N. Ravenswood Ave.
Chicago 13, Ill.

Texas Instruments, Inc.
6000 Lemmon Ave.
Dallas 9, Tex.

SEWAGE TREATMENT MATERIALS
The FX-Lab Co.
4 Hill St.
Newark 2, N. J.

Stewart-Hall Chemical Corp.
P. O. Box 66
Fleetwood Sta.
Mt. Vernon, N. Y.

SEWERAGE
Combustion Engineering, Inc.
200 Madison Ave.
New York 16, N. Y.

SHAFTING, FLEXIBLE
Teleflex Inc.
123 S. Main St.
North Wales, Pa.

SHARPENING STONES
Behr-Manning
3156 Howe St.
Troy, N. Y.

SHEET METAL
Inland Steel Co.
38 So. Dearborn St.
Chicago 3, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

SHOCK ABSORBERS
The Korfund Co., Inc.
48-15 32 Place
Long Island City 1, N. Y.

SHORES
Safway Steel Products, Inc.
6228 W. State St.
Milwaukee 13, Wisc.

SLIDE RULES
Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

SLINGS, WIRE ROPE
Broderick & Bascom Rope Co.
4203 Union Blvd.
St. Louis 15, Mo.

SLITTERS
Stanat Mfg. Co., Inc.
4725 37 St.
Long Island City 1, N. Y.

SOIL SAMPLING EQUIPMENT
Soiltest, Inc.
4711 W. North Ave.
Chicago 39, Ill.
See advertisement page 37

SOIL TESTING APPARATUS
Soiltest, Inc.
4711 W. North Ave.
Chicago 39, Ill.
See advertisement page 37

SOOT REMOVERS
National Aluminate Corp.
6216 W. 66th Pl.
Chicago 38, Ill.

SOUND SYSTEMS
Stromberg Carlson Co.
100 Carlson Road
Rochester 3, N. Y.
See advertisement page 9

DuKane Corp.
St. Charles, Ill.

New Jersey Communications Corp.
760 Fairfield Ave.
Kenilworth, N. J.

SPROCKETS
Whitney Chain Co.
554 Deering Rd., N. W.
Atlanta 9, Ga.

STAINLESS STEEL
United States Steel Corp.
525 William Penn Pl.
Pittsburgh 30, Pa.

STAMPINGS
The Stanley Works
Pressed Metal Div.
195 Lake St.
New Britain, Conn.

STEEL, COLD FINISHED BARS
LaSalle Steel Co.
Chicago 80, Ill.

STEEL, OTHER THAN STRUCTURAL
Inland Steel Co.
38 So. Dearborn St.
Chicago 3, Ill.

Jones & Laughlin Steel Corp.
3 Gateway Center
Pittsburgh 30, Pa.

LaSalle Steel Co.
Chicago 80, Ill.

United States Steel Corp.
525 William Penn Pl.
Pittsburgh 30, Pa.

STEEL PLATE FABRICATION
Carl T. Johnson, P. E.
197 La Salle Ave.
Kenmore 17, N. Y.

STOKERS
American Eng. Co.
Aramingo Ave. & Cumberland St.
Philadelphia 25, Pa.

Combustion Engr. Inc.
200 Madison Ave.
New York 16, N. Y.

Iron Fireman Mfg. Co.
3170 W. 106th St.
Cleveland 11, Ohio

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- A TOUR of the Zenith Foundry Company has been issued in brochure form. Eighteen pages of carefully coordinated photographs and text show each step of the production of Zenith's quality-controlled gray iron and alloy iron castings. A wide range of control applications with respect to both size and metal specifications is shown. Write now for your copy.

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Gisholt Machine Co.
1245 E. Washington Ave.
Madison 10, Wisc.

SUPPLIES, MACHINERY
Universal Vise & Tool Co.
Mill St., Parma, Mich.

SUPPRESSORS
Tobe Duetschmann Corp.
921 Providence Hwy.
Norwood, Mass.

SURVEYING INSTRUMENTS
Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

American Paulin System
1524 So. Flower St.
Los Angeles 15, Calif.

Arsco American, Inc.
3308 Edson Ave.
New York 66, N. Y.

C. L. Berger & Sons, Inc.
37 Williams St.
Boston 19, Mass.

David White Co.
315 W. Court St.
Milwaukee 12, Wisc.

Carl Heinrich Co.
711 Concord Ave.
Cambridge 38, Mass.

Huston Terra-Marine Co.
P. O. Box 1437
Corpus Christi, Tex.

Kern Instruments, Inc.
120 Grand St.
White Plains, N. Y.

Leupold & Stevens Instruments, Inc.
4445 N. E. Glisan St.
Portland 13, Ore.

The Thom Wood Co.
102 Webster St.
Rockland, Mass.

SWIMMING POOLS, SUPPLIES & EQUIP.
R. P. Adams Co., Inc.
251 E. Park Drive
Buffalo 17, N. Y.

Modern Swimming Pool Co., Inc.
1 Holland Ave.
White Plains, N. Y.

Swimquip, Inc.
1040 Huff Rd., N. W.
Atlanta 18, Ga.

SWITCH BOXES
General Electric Co.
Construction Materials Div.
1285 Boston Ave.
Bridgeport 2, Conn.
See advertisement Back Cover

SWITCHBOARDS
General Electric Co.
Distribution Assemblies Dept.
41 Woodford Ave.
Plainville, Conn.
See advertisement Back Cover

SWITCHES, ELECTRICAL
Ohmite Mfg. Co.
3601 Howard St.
Skokie, Ill.

—T—

TANKS, STORAGE
Airtherm Mfg. Co.
700 S. Spring
St. Louis 10, Mo.

Flint Steel Corp.
Box 1289
Tulsa 1, Okla.

M-H Standard Co.
513 Communipaw Ave.
Jersey City 4, N. J.

TANTUNG CAST ALLOYS
Vascoloy-Ramet Corp.
800 Market St.
Waukegan, Ill.

TAPS
Doall Co.
254 N. Laurel Ave.
Chicago 26, Ill.

TELEPHONE EQUIPMENT
Stromberg Carlson Co.
100 Carlson Road
Rochester 3, N. Y.
See advertisement page 9

DuKane Corp.
St. Charles, Ill.

Federal Telephone & Radio Co.
100 Kingsland Road
Clifton, N. J.

New Jersey Communications Corp.
760 Fairfield Ave.
Kenilworth, N. J.

The Universal Clay Products Co.
1528 First St.
Sandusky, Ohio

TELEVISION RECEIVERS
General Electric Co.
Electronics Div.
Electronics Park
Syracuse, N. Y.
See advertisement Back Cover

Stromberg Carlson Co.
100 Carlson Road
Rochester 3, N. Y.
See advertisement page 9

TEMPERATURE INDICATORS
The Barber-Colman Co.
P. O. Drawer 99
Rockford, Ill.

W. C. Dillon & Co., Inc.
14620 Keswick St.
Van Nuys, Calif.

Leeds & Northrup Co.
4970 Stenton Ave.
Philadelphia 44, Pa.

Tempil Corp.
132 W. 22nd St.
New York 11, N. Y.

TIMERS
General Controls Co.
801 Allen Ave.
Glendale 1, Calif.

TIRES
United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.

TOOLHOLDERS
Vascoloy-Ramet Corp.
800 Market St.
Waukegan, Ill.

TOOLS
Black & Decker Mfg. Co.
Towson 4, Md.

Doall Co.
254 N. Laurel Ave.
Chicago 26, Ill.

Red Devil Tools
Irvington, N. J.

Universal Vise and Tool Co.
Mill St.
Parma, Mich.

Vascoloy-Ramet Corp.
800 Market St.
Waukegan, Ill.

TOOLS, CEMENTED CARBIDE
General Electric Co.
Carboloy Dept.
11177 E. 8-Mile Rd.
Detroit 32, Mich.
See advertisement Back Cover

TOWERS, HOIST
Safway Steel Products, Inc.
6228 W. State St.
Milwaukee 13, Wisc.

TRACTORS
Caterpillar Tractor Co.
Peoria, Ill.

TRAILER ACCESSORIES
Martin Machine Co.
Kewanee, Ill.

TRAILERS
Ferree Motor & Equip.
2451 Randleman Rd.
Greensboro, N. C.

Kensington Welding & Trailer Co.
1114 Farmington Ave.
Kensington, Conn.

Martin Machine Co.
Kewanee, Ill.

TRAMWAYS, AERIAL
Riblet Tramway Co.
Box 7, Sta. A
Spokane 17, Wash.

TRANSFER MACHINES, STRAIGHT LINE
Ferguson Machine & Tool Co.
Roller Gear Div.
P. O. Box 5841
St. Louis 21, Mo.

TRANSFORMERS
Acme Elec. Corp.
Water St.
Cuba, N. Y.

TRANSFORMERS (Cont.)
Edwards Co., Inc.
Post Rd.
Norwalk, Conn.

Federal Telephone & Radio Co.
100 Kingsland Rd.
Clifton, N. J.

Zinsco Electrical Prod.
729 Turner St.
Los Angeles 12, Calif.

TRANSITS
Warren-Knight Co.
136 N. 12th St.
Philadelphia 7, Pa.
See advertisement page 39

C. L. Berger & Sons, Inc.
37 Williams St.
Boston 19, Mass.

David White Co.
315 W. Court St.
Milwaukee 12, Wisc.

Carl Heinrich Co.
711 Concord Ave.
Cambridge 38, Mass.

Kern Instruments, Inc.
120 Grand St.
White Plains, N. Y.

TRANSPORTATION EQUIPMENT
General Electric Co.
Apparatus Sales Div.
1 River Rd.
Schenectady 5, N. Y.
See advertisement Back Cover

TRUCK BODIES
Kensington Welding & Trailer Co.
1114 Farmington Ave.
Kensington, Conn.

Marmon-Herrington Co., Inc.
1511 W. Washington St.
Indianapolis 7, Ind.

TRUCK EQUIPMENT, ALL-WHEEL DRIVE
Marmon-Herrington Co., Inc.
1511 W. Washington St.
Indianapolis 7, Ind.

TRUCKS, LIFT
Revolvator Co.
8782 Tonnele Ave.
North Bergen, N. J.
See advertisement page 6

TRUCKS, MOTOR
General Motors Corp.
General Motors Bldg.
Detroit 2, Mich.
See advertisement Cover III

TUBING
General Electric Co.
Construction Materials Div.
1285 Boston Ave.
Bridgeport 2, Conn.
See advertisement Back Cover

Allied Metal Hose Co.
3746 Ninth St.
Long Island City, N. Y.

TUBING (Cont.)
The Babcock & Wilcox Co.
Tubular Products Div.
Beaver Falls, Pa.
See advertisement page 4

Wolverine Tube Div.
Calumet & Hecla, Inc.
1850 Guardian Bldg.
Detroit 26, Mich.

TUBING, CORROSION RESISTANT
The Babcock & Wilcox Co.
Tubular Products Div.
Beaver Falls, Pa.
See advertisement page 4

Wolverine Tube Div.
Calumet & Hecla, Inc.
1850 Guardian Bldg.
Detroit 26, Mich.

—V—

VALVES & FITTINGS
The Fairbanks Co.
393 Lafayette St.
New York 3, N. Y.

Jordan Corp.
6013 Wiehe Rd.
Cincinnati 13, Ohio

VALVES, SOLENOID
Automatic Switch Co.
391 Lakeside Ave.
Orange, N. J.

VIBRATION CONTROLS
Allied Metal Hose Co.
3746 Ninth St.
Long Island City, N. Y.

Jarco Services, Inc.
725 So. Erie
Tulsa 12, Okla.

The Korfund Co., Inc.
48-15 32 Pl.
Long Island City 1, N. Y.

VISES
Universal Vise & Tool Co.
Mill St.
Parma, Mich.

VOLTAGE REGULATORS
Acme Elec. Corp.
Water St.
Cuba, N. Y.

—W—

WASTE HEAT RECOVERY EQUIPMENT
The Lawrence Co.
Box 203
Port Washington, N. Y.

WASTE TREATMENT EQUIPMENT
Graver Water Conditioning Co.
216 W. 14th St.
New York 11, N. Y.

Infilco, Inc.
901 S. Campbell
Tucson, Ariz.

WATER CONDITIONING EQUIPMENT
General Filter Co.
Ames, Iowa

Graver Water Conditioning Co.
216 W. 14th St.
New York 11, N. Y.

Infilco, Inc.
901 S. Campbell
Tucson, Ariz.

The F. E. Myers & Bro. Co.
947 S. Orange St.
Ashland, Ohio

WATER TREATING CHEMICALS
Modern Swimming Pool Co., Inc.
1 Holland Ave.
White Plains, N. Y.

National Aluminate Corp.
6216 W. 66th Pl.
Chicago 38, Ill.

Cyrus Wm. Rice & Co.
15 Noble Ave.
Pittsburgh 5, Pa.

Stewart-Hall Chemical Corp.
P. O. Box 66
Fleetwood St.
Mt. Vernon, N. Y.

United Chemical Corp of N. M.
P. O. Box 955
Hobbs, N. M.

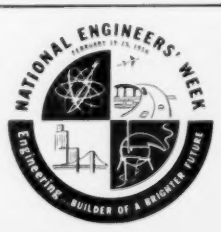
Wyandotte Chemicals Corp.
Michigan Alkali Div.
Wyandotte, Mich.

WINCHES, HAND
Lewis-Shepard Products, Inc.
120 Walnut St.
Watertown 72, Mass.

WIRE FABRIC
Wire Reinforcement Institute, Inc.
1049 National Press Bldg.
Washington 4, D. C.

WIRE ROPE
Broderick & Bascom Rope Co.
4203 Union Blvd.
St. Louis 15, Mo.

WROUGHT IRON PLATE
A. M. Byers Co.
Clark Bldg.
Pittsburgh 22, Pa.



Stassen to Speak at NSPE Spring Board Meeting

The Honorable Harold E. Stassen, Special Assistant to President Eisenhower, will be the guest of honor and principal speaker at the February 17th banquet of the National Society of Professional Engineers during the Society's February 17-18 Spring Meeting in Washington, D. C. It is expected that Mr. Stassen, whose White House responsibilities are concerned with disarmament matters and means of promoting world peace, will discuss some of the ways in which engineers can assume appropriate responsibility and contribute to lasting security.

The banquet, in the ballroom of the Mayflower Hotel which is the headquarters for the conference, will be the first in a country-wide series of similar dinners to be given in tribute to the engineering profession in connection with the observance of National Engineers' Week, February 19-25. Final plans for the Week will be reviewed and discussed during the professional sessions of the Spring Meeting.

Another well-known national figure, Representative Carl Hinshaw (Rep.) of California, will be the guest speaker at the Saturday luncheon. Congressman Hinshaw, who is also an engineer and serves on the Interstate and Foreign Commerce Committee of the House and the Joint Committee on Atomic Energy, is expected to discuss many aspects of public service in which the engineer will have a paramount interest with emphasis on his own personal experience in this regard.

A particular highlight of the two-day conference will be the dedication of the new NSPE national headquarters, a just-completed four-story building at 2029 K Street, Northwest, in downtown Washington. A number of Washington civic leaders and Government engineering officials will be on hand for the dedication, scheduled for four o'clock on the afternoon of the 17th, and for the reception which will be held immediately following the ceremony.

The two days of business and professional conferences will be preceded by a day-long meeting of the NSPE Executive Committee on the 16th. NSPE President Allison C. Neff will open the first general session on the morning of the 17th; and following the initial reports of the national officers, the attention of the delegates will be turned to the recommendations of the various NSPE committees, with the national vice presidents presiding for the presentation of the reports of the particular committees under their specific jurisdiction.

The first day of the meeting will also be the occasion for the regular regional luncheons at which the engineers from the various geographic areas get together, again with the appropriate regional vice presidents presiding, to exchange ideas and discuss mutual concerns.

The professional sessions, interspersed with the various social events, will continue through Saturday afternoon when the meeting will finally be adjourned. Among the many topics to be considered during the two days are: means for encouraging the study of science and mathematics in high school as a basis for future engineering study, problems of the young engineer, professional registration, national defense, the professional status of Government engineers, NSPE publications, functional groups, chapter activities, and the 1956 membership program.

NSPE's Executive Director Paul H. Robbins, left, and Prof. Russell B. Allen, Society Treasurer, inspect unique filing shelves in the library of the new building which will be dedicated at the spring meeting this month.

FEBRUARY MEETINGS Of Note

The Society of the Plastics Industry—Annual SPE Reinforced Plastics Division Conference, Feb. 7-9, Chalfonte-Haddon Hall, Atlantic City, N. J.

American Institute of Electrical Engineers; Institute of Radio Engineers; Association for Computing Machinery—Western Joint Computer Conference and Exhibit, Feb. 7-9, Fairmont Hotel, San Francisco, Calif.

Society of American Military Engineers—Annual Technical Meeting, Feb. 9-10, Palmer House, Chicago, Ill.

American Society for Quality Control—Middle Atlantic Conference and Aircraft Division Meeting, Feb. 10-11, Shoreham Hotel, Washington, D. C.

Associated General Contractors of America—National Convention, Feb. 13-16, Waldorf-Astoria Hotel, New York, N. Y.

American Institute of Mining Engineers—Annual Meeting, Feb. 20-23, Hotels Statler and New Yorker, New York, N. Y.

American Institute of Chemical Engineers—National Meeting, Feb. 26-29, Hotel Statler, Los Angeles, Calif.

American Society for Testing Materials—Spring Meeting and Committee Week, Feb. 27-March 2, Hotel Statler, Buffalo, N. Y.

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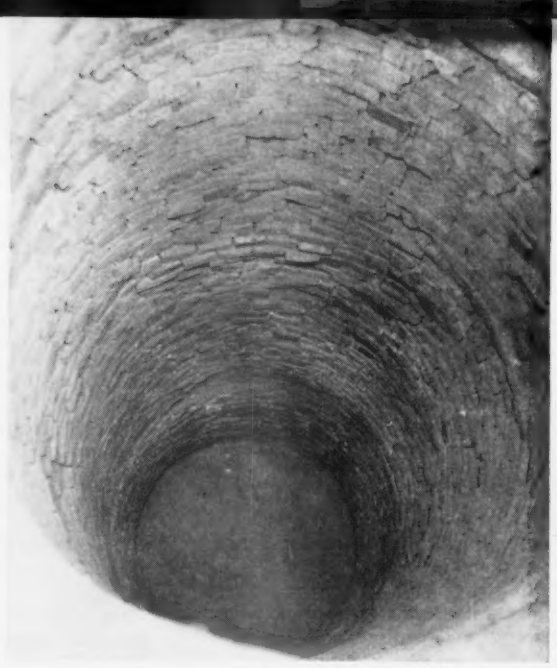
PERSPECTOGRAPH CORP.

285 Madison Ave., N. Y. 17, N. Y.

Records Show the President's First Love Was Engineering

Looking downward into one of George Washington's construction projects that failed. Washington had this 25-foot-deep ice well dug in the cellar of his Mount Vernon home. But all the ice he put into it in January melted by June, probably due to water seepage through the mortar in the brick siding.



Washington's skilled use of the surveyor's compass and drawing instruments mark him as a forerunner of today's civil engineer. These well preserved instruments, owned by Washington as a young man, are on display at the museum at Mount Vernon.

G. Washington Was a Man of 'Arithmetick'

ARE the members of the engineering profession really justified in "staking claim" to George Washington as one of the country's first engineer-builders?

The answer to such a question, as National Engineers' Week stirs up the usual amount of interest in Washington the engineer, is a very definite affirmative. Indeed, engineers are more historically correct than most of them realize in claiming our first President as an engineer type. For Washington, before his great military achievements in the struggle for American independence, was a complex individual with many of the very characteristics often found in engineers today.

Washington's engineering and technical interests have their roots far back in his earliest schooling. Who his teachers were and just where he got this schooling is lost in the mists of history. But it can certainly be assumed that young George received the best elementary education obtainable in the Virginia area in the 1730's. The education abroad of his two half brothers, and the social and economic status of the Washington family would strengthen this assumption.

His surviving school copybooks, carefully preserved in the Library of Congress, show him at an early age to have had a sound grasp of elementary arithmetic and geometry. In an entry dated in August, 1745, the 13-year-old scholar described geometry as: "One of the Seven Sciences, and a very useful and Necessary Branch of the mathematick; whose subject is greatness: for as Number is the Subject of Arithmetick, so that of Geometry is Magnitude, which hath its beginning from Point, that is a Thing Supposed to be indivisible, and the Original of all Dimension."

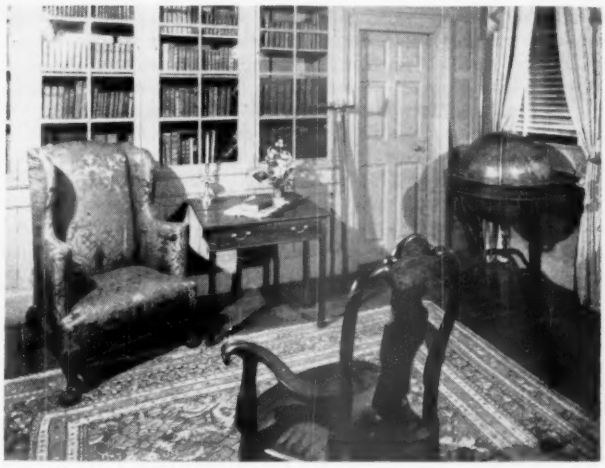
His school notebooks are filled with problems in practical land surveying. The pages of neatly drawn plots of fields, boundary lines, stands of timber, etc., testify to the early and extensive practice he must have had in map making. Some of the problems he was working on at the age of 14 are given only at the college level today.

Young George's interest in surveying must have been quickened by the surveying instruments owned by his father. Sometime between his 14th and 15th year George learned the fundamentals of surveying from one of the county surveyors or deputies. All indications are that he made rapid progress. By the time George was 16 he was earning fees in cash or tobacco for land surveys made on neighboring farms. The exacting care he took with these early work assignments was to become a definite part of his character as a man who gave his utmost to every task.

He Built Forts, Made Maps and Was an Excellent Surveyor

Telescope used by Washington at his Mount Vernon estate. It is typical of the 18th Century scientific instruments which our first President owned and used.

From this study in his Mount Vernon home Washington wrote the many letters which were so decisive in promoting the establishment of the Federal Government. The terrestrial globe, and surveyor's compass standing against the door frame were both used by Washington.



Young Washington's career as a surveyor has often been described in historical and popular articles. But his developing technical interests are perhaps better illustrated in the less well-known story of a sailing trip he made to Barbados Island. The 19-year-old George took passage on the ship as a companion to his half brother, Lawrence, who was going to the tropical island to seek relief from a lung ailment.

During the five-week voyage, George applied himself to the intricacies of navigation and the operation of a sailing vessel. He ruled off blank sheets of paper and made up his own ship's log with daily entries. His surviving diaries show how carefully he observed and recorded changes in course and weather, passing ships, and other details of shipboard life.

When the vessel finally came in sight of their island destination, the ship's officers, through faulty navigation, thought they were still many miles away. Their young surveyor-passenger was aware of what had happened and noted in his log: "Had we been distant but three or four leagues more, we should have been out of sight of the island, run down the latitude and probably not have discovered the error in time to have gain'd land for three weeks more."

Once ashore, the future military saviour of his country took what was quite likely his first look at a military fortification. In his methodical fashion he duly noted that the place was ". . . pretty strongly fortified, and mounts about 36 guns within the fortifications, but has two facing batteries mounting 51."

While still in his early 20's, Washington's skills as an observer and map-maker were tested when he, as military adjutant of Virginia, was sent on a mission to the Ohio Valley to ascertain French military plans for encroachment on the British colonies. Working under wilderness conditions and with only a compass to guide him, Washington made an accurate map of the entire journey. One contemporary historian suggests that a traveler on foot today, could, if equipped with only this map and a compass, journey from Cumberland, Maryland, to the vicinity of Erie, Pennsylvania.

WASHINGTON'S ability as a map-maker apparently never left him, even in later years when his mind was occupied with the political and economic struggles of the new Republic. During his first term as President he drew a map of his entire Mount Vernon estate. Washington referred to it as "a rude sketch of the farms." However, a chief of the division of maps in the Library of Congress stated that "no known map of an American farm in the 18th Century is superior to it."

Young Washington's grasp of military engineering is shown in his description of the fortification possibilities at the junction of the Allegheny and Monongahela Rivers: ". . . a fort at the forks would be equally well situated on the Ohio, and have the entire command of the Monongahela, which runs up to our settlements and is extremely well designed for water carriage, as it is of a deep, still nature. Besides, a fort at the forks might be built at much less expense than at the other place. Nature has well contrived this lower place for water defence; but the hill whereon it must stand, being about a quarter of a mile in length, and then descending gradually on the land side, will render it difficult and very expensive to make a sufficient fortification there. The whole flat upon the hill must be taken in, the side next the descent made extremely high, or else the hill itself cut away: Otherwise, the enemy may raise batteries within that distance without being exposed to a single shot from the fort."

As a young and inexperienced military commander,

Washington made mistakes during the campaigns against the French. But his diaries show that he learned continually, and profited by errors of judgement when he was aware of them.

One of Washington's most conspicuous deficiencies was his lack of public speaking ability. For a man who was to serve many years in the Virginia House of Burgesses and who would ultimately serve two terms as chief executive of the newly formed Republic, Washington was anything but skilled in public speaking. Indeed, it might be said that he never delivered a speech except when reading from a manuscript. Like so many engineers in our own times, Washington could not give verbal expression to the precise and ordered thoughts of which he was capable. To his fellow legislators who were accustomed to the fiery eloquence of Patrick Henry, Washington must have seemed almost a mute. The fact that Washington was held in such high esteem even though he was not verbally articulate is testimony to his many other abilities and force of character.

When Washington was given command of the American troops in the Revolutionary War, he started off with a characteristic statement: ". . . I will keep an exact account of my expenses." After the defeat of the British, he retired to his Mount Vernon home overlooking the Potomac River in Northeastern Virginia. Free from the daily pressures of war and command, Washington turned his "exact accounting" to the progressive management of a plantation estate. It was no idle life that the Master of Mount Vernon took up in his military retirement. Washington's letters and diaries of this period show what a lively interest he took in new discoveries and technical inventions. A problem in farming was likely to induce him to propose a solution in terms of a new technique or a piece of newly designed equipment. The latter approach is shown in his original designs for an experimental barn and a "barrel plow" for planting grain.

Washington made diary entries about a proposed threshing machine, a device for the exact measurement of candle "burning power," steam power for boats, and many other technical innovations. While President he personally issued a "passport" to the French balloonist, Jean Pierre Blanchard, on the occasion of the airman's making the first balloon ascension in Philadelphia (and the Western Hemisphere) in 1793. His interest in low cost river transportation for the growing Colonies led him to organize a company for the construction of a mile-long canal on the Potomac that allowed river traffic to bypass the treacherous Great Falls.

THE well-preserved mansion home at Mount Vernon is in itself a monument to Washington's talents for design and building. The mansion is an outstanding example of colonial architecture. Washington's extensive domestic records give no evidence that he employed architectural assistance. The columned piazza, extending the full length of the building on the river side, is apparently from an original design by Washington. The siding on the mansion, called "rusticated Boards" by Washington, was also his own idea. The frame boards on the siding were beveled to look like stone, and sand was put on the fresh painted surface. A publication of the Mount Vernon Ladies' Association states that "no precedent has been found" for the use of such siding on buildings in Washington's time.

The estate, which in Washington's day totaled more than 8,000 acres, was planned by its owner around functional and aesthetic considerations. However, even as shrewd a designer and builder as Washington could expend considerable effort and achieve something less than a functioning objective. His ice well in the cellar of the Mount Vernon mansion is an example of a forward looking project that turned out to be a complete failure.

Ice was cut on the Potomac River in the winter and stored in ice houses throughout the rest of the year. The typical plantation ice house was a small frame or brick building constructed over a pit dug in the ground. There were such conventional ice houses on the Mount Vernon estate. Consequently, Washington must have had something quite definite in mind when he developed the project of digging a deep, circular ice well in the cellar of his mansion. There are no surviving explanations as to why he built such an ice well. But it seems clear that what he was aiming at was both the storage of ice and the utilization of its cooling effects in his home during the long Virginia summers.

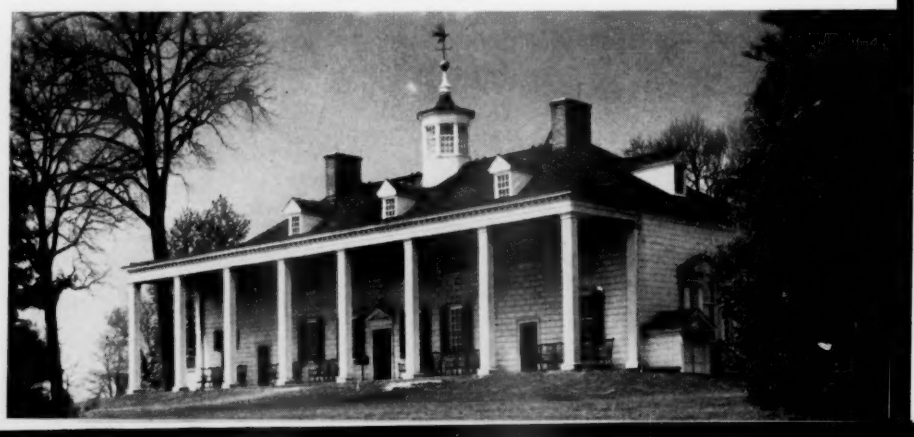
Two entries in his diary for the year 1785 tell how his hopes for this home refrigeration project were dashed:

Saturday, Jan. 8—"Drawing Ice from the river to my well in the Cellar. Got ¾ full and well pounded, as it was thrown in."

Sunday, June 5 —"Opened the Well in my Cellar in which I had laid up a store of Ice but there was not the smallest particle remaining. . . ."

An examination of the brick sides of the ice well indicates that water seepage was probably the cause of Washington's ice disappearing before June 5. Had he known that the temperature of ground water is about 50 degrees Fahrenheit, and had he realized how difficult it would be to find a spot where a 25-foot-deep dry well could be dug in that area, he would very likely have given his refrigeration project a more careful study before beginning what must have been a considerable digging and masonry operation.

—End.



His plantation home at Mount Vernon incorporated many of Washington's own architectural and engineering plans, including the frame siding on the mansion which was made to look like stone, and the columned piazza running the full length of the building.

Above, left: California Governor Goodwin J. Knight, second from left, presents an Engineers' Week proclamation for his state to Fred M. Johnson, president of the CSPE. Looking on are, left, Logan N. Muir, Jr., president of the Sacramento Chapter of the CSPE; and George E. Zelhart, national director from the CSPE. At right: Governor Christian A. Herter pauses after signing an Engineers' Week proclamation for the State of Massachusetts. Behind the Governor are, left to right, Howard M. Turner, president, Engineering Societies of New England; J. Frederick Way, president, Massachusetts Society of Professional Engineers; J. W. Thompson, chief engineer, New England Telephone and Telegraph Company; L. E. Crane, general chairman, Massachusetts Engineers' Week Committee; Dr. William F. Ryan, vice president and senior consulting engineer, Stone & Webster Engineering Corporation; and Chester A. Corney, vice president and director of engineering and construction, Boston Edison Company.

U. S. Set for 'Biggest' Engineers' Week

Once again the month of February has arrived and with it has come National Engineers' Week, the number one public relations activity of the engineering profession.

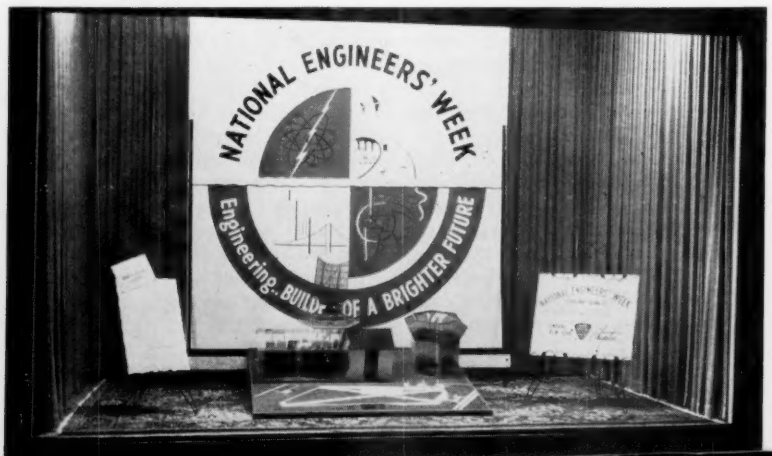
The NSPE-sponsored observance will begin officially on Sunday, February 19, and continue through Saturday, February 25. This year will mark the first time that all the state societies are observing the Week during February.

The photographs on this page typify the advance work that has been done all over the country as proclamations and letters of tribute are signed by state governors and the mayors of hundreds of cities. Governor Knight of California is shown presenting a proclamation which begins "The vital importance of the engineering profession to civilization defies description and definition. The scope and magnitude of mankind's activities have made us all heavily dependent upon the genius and training of the men and women in the multiple phases of the engineering arts. . . ."

As the final preparations for the Week got under way, NSPE affiliates were planning a full program of events. Guest speakers for dinner and luncheon meetings have been scheduled, exhibits are being planned for public display, and special newspaper and magazine sections have been developed.

Complete reports on the Week's observance at the state and chapter level should be made to the National Society. The reports should include newspaper and magazine clippings, photographs of exhibits, listings of radio and TV programs on which public service time was obtained, and any other information concerning the promotional efforts for the Week.

The display below has been installed in the window of the Niagara Mohawk Power Corporation Main Office Building at Syracuse, New York. It highlights a medium range surveillance radar set designed to give the air traffic controller an all weather picture of traffic conditions within a 60 mile radius of an airport. This is the first of a series of presentations placed in the city by Central New York Chapter of the New York State SPE. The committee consists of H. Earle Revercomb, Carl E. Pruiss, and John E. DeTore.



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Executive Director

N.S.P.E.

SECTION Three of the Canons of Ethics for Engineers states, "The engineer shall endeavor to extend public knowledge of engineering . . ." NSPE states in its Constitution that one of its objectives "shall be the advancement of the public welfare . . ." It is obvious, therefore, that one of the ways in which professional engineers can fulfill Section Three of the Canons of Ethics is through organizations such as the National Society of Professional Engineers.

Through the effective three-level organization of NSPE, the engineering profession is doing much to be of public service. Individual members and officers at all levels of the Society are continually giving such service by answering general questions in person and by mail, providing pertinent data about the profession, cooperating in appropriate civic-spirited programs, supporting or opposing proposed legislation in which the engineer—and hence the public—has a vital concern, and performing countless other tasks that come in the day-by-day routine of any such organization. Obviously the instances of service rendered are too numerous to record in the summaries of Society activities, such as the *Annual Report*, or to report in detail in the AMERICAN ENGINEER or other NSPE publications. Nevertheless, the sum total of these services is a very big factor in the work of NSPE.

The Society's national headquarters, situated as it is in the Nation's Capital, receives hundreds of inquiries through the mail, by telephone, and during the personal visits of individuals interested in various facets of the engineering profession. The store of information accumulated at the headquarters office is always available so that prompt, accurate replies can be provided.

In addition to such routine queries as those about registration, or the numbers of engineers in each branch of the profession, or the Taft-Hartley Law, unique problems and questions are frequently presented; and these, too, receive immediate and effective attention. Following are a number of outstanding examples of such services rendered by the Society through its headquarters personnel.

Assistance was recently given to the placement director of a large company who needed information on the starting salaries of engineers. NSPE has an excellent file of statistics on this subject, and was thus able to send the director a complete, up-to-date tabulation on the current salary situation.

Deluged with a wave of phone calls, telegrams, and letters recently from members, other engineers, companies, students, etc., on the application of the Reserve Forces Act to engineers, the headquarters office promptly supplied the desired information. This was also followed up later with special supplementary letters when the Executive Orders pertaining to the Act came out.

Information was supplied to the ambassador of a Near East country on opportunities for that country's nationals to gain practical engineering experience and/or education in the United States.

Many requests for pertinent material from industries interested in cooperating in the National Engineers' Week observance have been filled at the Washington office. Over ten thousand copies of the Eisenhower letter, several thousand copies of the booklet, *The National Engineers' Week Story*, and many other promotional aids have been distributed to the interested companies.

The impact of the four Executive Research Survey Reports is still increasing as NSPE sends out additional copies in response to requests for information about training programs in industry, engineer-management communications, manpower utilization, and incentives that keep professional employees on the job.

Only a few months ago NSPE cooperated in providing a great deal of material in connection with a refresher course being organized for civilian employees at Fort Belvoir, Virginia, who were being encouraged to prepare for the registration examination.

These represent but a minimum sample of the many public services rendered at the national level as a result of the support of the members of the Society. State society and chapter officers could extend the list many times.

NSPE believes that this unpublicized service is one of the very tangible means by which professional engineers of the Nation, through their professional organization, can fulfill a small part of the obligation they have to promote the public welfare. This public service also is of direct benefit to the members of the Society: for not only does it acquaint various segments of our population with the value and activities of engineering, but it continually impresses upon them that engineering is a learned profession, the members of which are proud of their heritage and willing to go, as Dr. Wickenden put it, "the second mile by which a calling can attain to the dignity and distinction of a profession."—***End.***

NEW Processes . . .

Hanford Operations Gaged By Measuring Radiation

This is a method of gaging the effectiveness of chemical operations in an atomic refinery by measuring radiation coming from process solutions.

Speaking at the Nuclear Engineering and Science Congress, M. B. Leboeuf, General Electric Company engineer, told how this scheme is used at the Hanford plutonium plant to permit control of the processing of spent nuclear fuels.

Liquid samples are periodically drawn into small sample chambers on an automatic basis. Gamma radiation (similar to X-rays) coming from the samples hit sensitive scintillation counters.

Electrical signals from the counters are sent 100 to 200 feet to a control room and analysed in terms of pulse rate and strength. This is a measure of the type and concentration of radioactive isotopes in the samples

Control steps then can be taken to adjust the chemical process, if necessary, until the counter output reaches a level corresponding to ideal operating conditions.

Nation's Largest Vacuum Melting Furnace

The nation's largest vacuum melting furnace was tapped recently by Vacuum Metals Corporation at Syracuse, N. Y.

This new 2200 pound furnace is remotely operated by the melter, who can control from one console the charging, mold transfer, and pouring operations. The melting unit is enclosed in a ¾ inch thick air tight and liquid cooled stainless steel chamber, with connecting air lock chambers for charging raw materials and discharging ingots.

The design makes it possible to charge, melt, pour and remove ingots without affecting the vacuum in the melting chamber. The mold handling mechanism makes it possible to cast ingots of varying size and shape, either singly or in multiples from a single heat. The new unit increases by 60 to 75 tons the monthly potential supply of vacuum metal for industry.

The products of this process are characterized by cleanliness and low gas content, with consequent higher elevated temperature strength and ductility.

Prefab School Solves Classroom Shortage

A practical, low-cost school, composed primarily of wood, steel and glass, and placed in operation 21 days after the slab foundation had been completed, is a practical demonstration of how prefabricated construction may solve the nation's acute classroom shortage.

Edgelea School in Lafayette, Indiana, proved that prefabricated schools can be erected far more quickly than the conventional type. But it is also more economical to build, and expansion can be achieved quickly, with comparable economy, and without impairing the original design. Yet, the school offers features desired in the most expensive structures.

Each unit has a pair of Classrooms and a project area with a glazed corridor. The 2,700 square foot unit contains a utility core with twin washrooms, counter-flow warm air furnaces individually controlled, storage space and classroom wash counters with sinks and drinking fountains.

At the present time, the one-story school has eight classrooms, including a kindergarten and an office. Designed by Walter Scholer and Associates of Lafayette, the expanded school will total 18 classrooms, an administrative suite, assembly hall, gymnasium and cafeteria when completed.

The Edgelea School roof deck is Tectum, a product of Peoples Research & Manufacturing Co., Newark, Ohio. Tectum is a wood fiber building material, which also serves as the exposed' finished ceiling. It has high sound and thermal insulation values, is non-combustible, economical to maintain, and easilly installed. The Tectum deck is supported by metal tees fastened to the top of the laminated wood roof beams on 24-inch centers. A built-up roof of tar and gravel covers the deck.

At Edgelea, basic cost per classroom was $18,444. The national average per classroom currently is quoted at $37,000.

The contract for Edgelea was awarded on June 20, and grading began that day. The schedule was as follows: June 24—Foundation started; August 3—Columns and beams erected; August 4—Roof deck installed; August 5—Wall panels erected; September 6—School completed, ready for occupancy.

Despite this speed, the school's developers, National Homes Corp., believe that an even faster construction schedule can be maintained in the future. Because Edgelea was a pilot model, delays in procurement of certain materials and equipment were experienced.

Functional, prefabricated Edgelea School at Lafayette, Ind. Completed 21 days after foundation's laying.

Pre-enameling Process For Porcelainizing Aluminum

Porcelain enameled aluminum takes a big step toward wider usage with the development by Aluminum Company of America of a time and cost-cutting pre-enameling process.

Known as the Alcoa R-100 Process, the patented chemical treatment is simple, inexpensive and well suited to a continuous enameling operation. The new conditioning treatment will eliminate multiple chemical baths and the prefiring operation, formerly necessary to insure a controlled surface.

When applied to aluminum, the R-100 Process will produce a uniform, conditioned surface in one step. The metal will then readily accept a porcelain coating. The process has passed all known laboratory tests and substantial savings in manufacturing costs are anticipated from its use.

The patented R-100 Process was developed by Alcoa after several years of research. It is expected to enhance the use of colorful porcelain enameled aluminum on buildings and elsewhere.

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Wisconsin Highlights

Many Outstanding Professional Events Mark State Society Meeting

The Wisconsin Society of Professional Engineers held its annual meeting January 26-28, with headquarters at the Schroeder Hotel in Milwaukee.

A special feature for the first day of the meeting was the College-Industry Conference held at Marquette University under the co-sponsorship of the Relations with Industry Division of the American Society for Engineering Education and the WSPE. The theme of the conference was The Humanities in Engineering.

The regular sessions of the annual meeting included functional group conferences in Education, Industry, Public Employment, and Consulting, as well as regular committee meetings.

A special panel discussion on *Engineers and Their Relations with Management* was another highlight of the three-day event. The panel was moderated by NSPE Executive Director Paul H. Robbins. Participants were C. Y. Thomas of Kansas City, Missouri, Virgil E. Gunlock of Chicago, John B. Jardine of Fargo, North Dakota, and John D. Coleman of Dayton, Ohio, all well-known engineers in industrial circles and active in the official echelons of NSPE.

The closing luncheon on January 28 was marked by the presentation of WSPE-sponsored awards to outstanding high school teachers in mathematics and science.

P.E. PUBLICITY CHAIRMEN

YOU have a date for FEBRUARY 25th!

That's the time to send your Engineers' Week story to the *American Engineer*.

As usual, space will be limited but we will give as wide coverage as possible. So get the news of the week's outstanding events in the mail EARLY.

FEBRUARY 25th is the day to do it!

Report On Russian Visit Made In Delaware

Dr. Weldon H. Brandt, engineering manager and director, Systems Department, Westinghouse Electric Corporation, Pittsburgh, was the guest speaker at the January 12th dinner meeting of the Delaware Society of Professional Engineers. Dr. Brandt, who has recently toured Russia and visited a number of Soviet industrial plants, spoke on the engineering aspects of his visit.

Program chairman for the evening was Albert W. Strahorn. The meeting was held at Hanna's Restaurant in Wilmington.

Civil Defense Receives Attention

Civil defense was the subject under discussion at the January 7th dinner meeting of the Midwestern Chapter of the Pennsylvania SPE. Ross I. Webb, Western Area Director of Civil Defense, was the guest speaker. His talk was entitled *What We Learned in Nevada*, and it was supplemented with the showing of both slides and movies depicting the effect of blast waves on various types of structures and utility installations.

The meeting was held in Farrell, Pennsylvania.

P. H. Robbins To Be Speaker In Buffalo

NSPE Executive Director Paul H. Robbins is scheduled to be the speaker at the February 20th Engineers' Week meeting of the Erie County Chapter of the New York State SPE. Mr. Robbins will report on National Society activities, and there will also be special Engineers' Week material included in the program.

Children's Night In Kansas

The Smoky Valley Chapter of the Kansas Engineering Society sponsored a unique social evening recently. Dubbed "Children's Night," the meeting was devoted to the entertainment of the children of the chapter members. A movie was shown, and a magician provided additional amusement for the young guests.

. . . more news on page 57

PROFESSIONAL PLANNERS — The picture at the left below shows officers of the Tulsa Chapter of the Oklahoma SPE discussing program plans for the current year. Seated, left to right, are: M. T. Nigh, executive vice president; W. R. Clarke, president; and L. T. Bossard, immediate past president. Standing are: M. J. Myers, Jr., secretary-treasurer; F. M. Bartlett, vice president—meetings and programs; C. M. Gordon, Jr., vice president—public relations; and M. J. Peterson, vice president—membership.

The second photo, taken during a recent meeting of the North Dakota SPE at which NSPE President Allison C. Neff was a guest, shows (seated): Kenneth Haugrud, secretary-treasurer; A. L. Bavone, president; and Joseph R. Kirby, vice president. Standing are: Edward Booth, national director; L. W. Veigel, immediate past president; Everett Loeb, NDSPE district director; Mr. Neff; and Henry Mott and Edward C. Lawson, district directors.

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Restricted to Registered Professional Engineers . . . Directory Continued on Next Page

R. F. Miller Addresses Philadelphia Meeting

Robert F. Miller of Tamaqua, Pennsylvania, an NSPE national director and a past president of the PSPE, was the guest speaker at the January 5th dinner meeting of the Philadelphia Chapter. He discussed legislation affecting the Pennsylvania Registration Act.

The meeting was also the occasion for the chapter's celebration of "Past Presidents' Night."

Registration Requirements Are Meeting Topic

Requirements for Professional Engineering Registration was the subject covered in a speech by L. P. Zimmerman, chief engineer of the Minnesota Highway Department, at a recent meeting of the Minneapolis Chapter of the MSPE. Mr. Zimmerman's lecture was supplemented by a second talk delivered by Lewis L. Anderson, former special assistant attorney general and legal advisor for the State Registration Board; he discussed the enforcement of the Registration Law in Minnesota.

A third address on the theme, *Let Us Be Professional*, was delivered by Dr. J. B. Calva, president and technical director of the J. B. Calva Company.

The meeting, which was held at the Dyckman Hotel in Minneapolis, was planned by the Young Engineers' Committee of the Minneapolis Chapter.

. . . more news on page 59

CERTIFICATE CEREMONY — In the picture at the right, W. H. Lesser of Scranton, a ten-year member of the Pennsylvania Examining Board for the Registration of Professional Engineers, is shown presenting certificates to new registrants F. Ellis Green, Albert J. Capptelloni, Nicholas C. Scandale, Albert J. Flodd, and James M. Gearhart (l. to r.) during a recent meeting of the Northeast Chapter of the PSPE.

Mr. Lesser, a leading consultant who is also vice president of the Northeast Chapter, delivered the address of the evening on the subject, *Today's Engineering and Engineers.*

He also presided and spoke at similar ceremonies sponsored by the Anthracite and Lehigh Valley Chapters. In all, twenty-five young engineers received their licenses.

Alphabetized by States . . .
New York-Pennsylvania

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TACOMA CHAPTER IS ORGANIZED—The picture above was made during the charter meeting of the new Tacoma Chapter of the Washington Society of Professional Engineers. It shows L. R. Durkee (left), NSPE Western Region vice president, looking on while Walter S. Gordon (center), president of the new chapter, receives the charter certificate from Jack M. Lyerla, WSPE president.

In addition to Mr. Gordon, other officers of the new chapter are: Hugh C. Miller, vice president; Ernest F. Dodge, secretary-treasurer; Harold F. Sitts, state trustee; Robert C. Wing, state trustee; and William D. Smith and David M. Hopkins, Executive Committee members.

Officers and members of both the Seattle and Spokane Chapters were on hand for the charter meeting to welcome the Tacoma P.E. group into the State Society.

Functional Groups Okayed In Missouri

At the recent meeting in Springfield, Missouri, of the MSPE's Board of Directors, official sanction was given to the formation of functional groups within the framework of the Missouri Society. The MSPE Constitution and By-Laws Committee was instructed to study the matter and make any recommendations for changes that might be necessary to carry out the program.

University Research Role Discussed

Ralph A. Morgen, research director of the Purdue Research Foundation and professor of chemical engineering at Purdue University, was the guest speaker at the January 12th meeting of the Lafayette Chapter of the Indiana SPE. Professor Morgen discussed *The Role of the University in Engineering Research.*

The meeting was held at the Purdue Union Building.

. . . more news on page 60

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NYSSPE Plans Industry Exhibit

The New York State Society of Professional Engineers has announced that it will run its 30th Engineering Industries Exposition in conjunction with its annual convention on May 17, 18, and 19 at the Statler Hotel in New York City.

Among those who have already contracted to exhibit in the coming exposition are the New York Telephone Company, D. B. Steinman, Reliance Steel, Industrial X-Ray Engineering, Portland Cement, New York Traprock, Borden Metal Products, Raymond Concrete and Consolidated Edison.

The Consolidated Edison Company will exhibit a scale model of the reactor which it is constructing at Peekskill to supply atomic power to New York City.

George Baer of the Foster-Wheeler Corporation, a member of the Westchester Chapter, is the chairman of the Convention Committee.

Cleveland SPE Installs Officers

Installation of new officers was the highlight of the January 24th banquet of the Cleveland Society of Professional Engineers, a chapter of the Ohio SPE. The engineers now administering the affairs of the Cleveland group are: James R. McKinney, president; Frank C. Palocsay, vice president; Rodney Harwood, secretary; Fred Gaub, treasurer; and George V. Fleck, historian. New directors also installed during the meeting are John O. Archer, Calvin B. Dalton, Anton J. Eichmuller, John B. Scalzi, Frank C. Stanek, and Stanley E. Strunk.

Speaker of the evening was Hugo E. Johnson, vice president of the Lake Superior Iron Ore Association.

California Meeting Features Lecture

A lecture by Professor Everett D. Howe of the Mechanical Engineering Department of the University of California at Berkeley was the main feature of the January meeting of the San José Chapter of the California SPE. Professor Howe discussed California water resources, selecting as his main theme, *Alternate Sources of Water*.

Fire Insurance Is Meeting Topic

Fire Insurance and How It Concerns the Engineer was the subject treated by two speakers at the January 11th dinner meeting of the Reading Chapter of the Pennsylvania Society. The speakers were two local insurance executives—Courtney Haddock and John Homer.

The meeting was held at the Wyomissing Club.

Letters

(*Continued from page 4*)

N.S.P.E. still is that in order to protect the public interest against malpractice and incompetence the practice of professional engineering should be limited to licensed professional engineers and on that basis the changes sought by C. E. L. should be opposed. The changes sought by C. E. L. would seriously weaken the licensing of professional engineers, the Society and the profession.

We here in Monroe Chapter believe our objection as stated above is primary, elemental, basic and should be kept in the forefront of any discussions dealing with legislative changes concerning the practice of engineering under a corporate business structure.

Incidentally, we also object to the use of the phrase "corporate practice of engineering." We believe that the profession of engineering can be practiced only by individuals, not by corporations, that professional engineering responsibility must rest with the individual. However, we also believe that professional engineering considerations are independent of the form of business structure and that the practice of engineering under a corporate business structure is not only permissible but in many cases desirable. However, this does not mean "corporate" practice of engineering.

In summary, our objections to C. E. L.'s proposals are that they would permit professional engineering to be done by nonqualified persons—not that they involve practice under a corporate business structure.

Monroe County Chapter,
N.Y.S.S.P.E.,
Board of Directors,
PHILLIP M. KIMMELL,
P.E., President:
KENNETH C. LACY, P.E.,
Secretary

► For the record, the NSPE Board has adopted the following resolution which is pertinent to the subject of corporate practice of engineering:

". . . NOW, THEREFORE, BE IT RESOLVED, That the National Society of Professional Engineers affirms the responsibility and right of each member State engineering society to recommend and support those amendments and revisions to the state engineering registration law which it considers will best serve the public interest, and

BE IT FURTHER RESOLVED, That the National Society of Professional Engineers supports its State Societies in any attempt to obtain revision of its engineering registration law, in which the licensing of qualified individuals to practice engineering is the basic concept of professional status, irrespective of the type of business organization in which the professional engineer is a member."

—Editor

Dissatisfied P.E.'s . . .

Dear Editor:

Several weeks ago, I received an article setting forth the dissatisfaction and the cause of this dissatisfaction among engineers in industry. The case was proved by

(*Continued on page 66*)

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STRICTLY BUSINESS

Personalities . . . Promotion of **Keith Conrad** to chief engineer, Pacific Coast Division of the **Owens-Illinois Glass Co.** of Toledo, O., has been announced by **E. R. Owens,** division general factories manager. He will be succeeded as chief project engineer of the General Research Department at the company's Toledo Technical Center by **Robert R. Denman. . . . Crucible Steel Company of America,** Pittsburgh, has appointed **Bernard L. Jones** to the newly-created position of chief engineer and has named **Tore Wallin** assistant chief engineer, according to **Joel Hunter,** president. . . . **M. Mack Earle** has been appointed chief naval architect of the **Maryland Shipbuilding & Drydock Company,** according to **George H. French,** president. . . . The appointment of **David G. Soergel** as manager of the new Applications Department of Autonetics, a division of **North American Aviation, Inc.,** Los Angeles, has been announced. . . . **M. S. Umbenhauer** has been named manager of power plant design for **The Fluor Corporation, Ltd.,** Los Angeles, according to **J. S. Fluor,** president. . . . **Winnard E. Karr** is the new chief engineer of Fawick Airflex Division, **Fawick Corporation,** Cleveland, O.

Mr. Conrad

James P. O'Donnell, consulting engineer, New York and Beaumont, Tex., has announced the following staff promotions: **John J. Lanigan,** to senior associate engineer while also retaining the post of chief engineer; and **George J. Feinman** and **Edward G. Fitzgerald,** to associate engineers. . . . **James Mair,** formerly vice president in charge of sales for **Goslin-Birmingham Company, Inc.,** Birmingham, Ala., has joined the Conkey Division of the **Chicago Bridge & Iron Company,** designers and manufacturers of filters, evaporators, and crystallizers. . . . **Howard J. Belser** is now serving as administrative coordinator in Seoul, Korea, for the **Korean Fertilizer Project, Chung-Ju,** a joint venture between **F. H. McGraw & Company** and **Hydrocarbon Research, Inc.** of New York. . . . **R. Patrick Turner** has been named manager of the Conduit Division of the **Stillwater Clay Products Co.,** Cleveland, O. . . . The appointment of **Allan A. Watson** as manager—assemblies and components sales has been announced by **Hershner Cross,** general manager of the **General Electric Company's** Distribution Assemblies Department in Plainville, Conn.

Mr. Mair

R. C. Teasel has been promoted to the post of director of research for **Champion Spark Plug Company,** Toledo, according to **R. A. Stranahan, Jr.,** president. . . . Election of **George E. Kopetz** to the position of vice president in charge of production of **Blaw-Knox Company,** Pittsburgh, has been announced by **W. Dordes Snyder, Jr.,** president. At the same time Mr. Snyder also disclosed the promotion of four employees to newly-created posts of vice presidents in the Chemical Plants Division, as follows: **Arne O. Olson,** vice president in charge of engineering; **Keator McCubbin,** vice president and manager of the Midwest headquarters, Chicago; **Charles F. Hauck,** vice president for sales; and **Edward S. Wright,** vice president in charge of construction. . . . **Gordon Stanley** has been appointed purchasing agent for **SOILTEST, Inc.,** Chicago, manufacturer of apparatus for engineering tests of soils, concrete, and asphalt. . . . **John P. H. Perry** has been elected a consultant to the New York City engineering firm of **Seelye Stevenson Value & Knecht. . . . James H. Howard** of **James H. Howard & Associates,** Houston consultants, is celebrating the completion of ten years in the consulting field, according to an announcement from the firm.

Mr. Teasel

Clary Corporation, San Gabriel, Calif., has appointed two assistant chief engineers to head new development programs for electronic and data-processing equipment and for business machines. They are **Kenneth F. Oldenburg** and **Milton Scozzafava. . . . T. H. Pierson** has joined **Eggelhof Engineers, Inc.,** Houston, Tex., as a vice president. . . . The appointment of **Lee Wilson** as manager of the Air Compressor Division has been announced by **Bell & Gossett Company,** Morton Grove, Illinois. . . . **Milton A. Chaffee** has been named director of electronics and systems research for the **Fairchild Camera and Instrument Corporation,** Syosset, N. Y. . . . **Axel W. Hedberg** has been appointed works manager of the **Leece-Neville Company,** Cleveland, according to **A. D. Gilchrist,** vice president.

New Firms and Offices . . . Word has been received of the formation of the **Seaman-Gunnison Corporation,** Baraboo, Wis., from **Ivor E. Gunnison,** founder and sole owner of the predecessor **Gunnison Mfg. Co.** and president and general manager of the new firm. In the new organization he has been joined by **Donald J. Seaman, Jr.,** formerly chief engineer of **Seaman Motors, Inc.,** Milwaukee, who will carry the responsibilities for engineering and new equipment development. Present plans call for the development and manufacture of new road building equipment as well as the present line of Gunnison asphalt distributors and street flushers. . . . Announcement has been made by **Colonel Sidney H. Bingham (ret.)** of the opening of his new office for consulting engineering at 109 East 35th Street, New York 16, N. Y. Col. Bingham has also recently been retained as a consultant by **Monorail, Inc.,** of Houston, Tex.

. . . NEW LITERATURE . . .

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

COLORS FOR ALUMINUM—Colors for anodized aluminum that resist fading from sunlight and outdoor exposure are shown in a brochure published by Sandoz Chemical Works, Inc. The new brochure describes the anodizing, dyeing and sealing procedures necessary to obtain maximum light fastness. Includes samples of five colors found to be most suitable for outdoor use selected after exhaustive tests made in hot Arizona sunlight, under ultraviolet carbon arc lamp and outdoor exposures up to seven years duration. Copies of "Colors for Outdoor Applications on Anodized Aluminum" are available by request on company stationery from Sandoz Chemical Works, 61 Van Dam Street, New York 13, N. Y.

—AE—

TUBING—The Babcock & Wilcox Co. issues three brochures on tubing of special interest to engineers and designers. TB-357 provides information pertaining to tubular products intended for sub-zero temperature applications. TB-360 will acquaint the design engineer with the advantages to be gained by utilizing mechanical tubing. TB-408 contains a complete listing of types of tubing and a brief description of various kinds of technical literature available on such specific types of tubular products as stainless and alloy tubing, stainless pipe, stainless sanitary tubing, heat exchanger and condenser tubing, boiler tubing, and mechanical tubing. In addition, it contains a table of chemical analyses, physical properties, mechanical properties, and creep strength of twenty steels, which are used by the processing industries. Request one or all by number from Sales Office, Tubular Products Division, The Babcock & Wilcox Co., Beaver Falls, Pa.

—AE—

SCHOOL CONSTRUCTION—A design data file on the use of porcelain enameled panels in school construction has been published by Ingram-Richardson Manufacturing Company. Included are photographs, technical data and architectural drawings on four basic types of installations—double faced panel, single faced panel, Vision-Vent type panel and corrugated porcelain enameled aluminum panel. Copies of Ing-Rich Porcelpanels data file No. 300 may be obtained from Ingram-Richardson Manufacturing Company, Beaver Falls, Pa.

—AE—

TREATED TIMBER PILES—"Pressure Treated Timber Foundation Piles" has been published by the American Wood Preservers Institute. Comprehensive and well illustrated, it is available free to architects, engineers, and builders interested in foundations for heavy buildings, bridges, grain elevators, seawalls, viaducts, and overpasses. Filled with documented case histories, this treatise includes (1) pile driving formulae; (2) means for determining safe loads; (3) methods of solving problems of uplift and lateral forces; and (4) protective devices for use during driving. For single copies address requests on company letterhead to the American Wood Preservers Institute, 111 W. Washington Street, Chicago 2, Ill.

METAL GRATINGS—An illustrated report on the usage of Steel, Aluminum and Stainless Grating and Stair Treads has just been published by the Klemp Metal Grating Corp. The report (in brochure form) discusses the various types of electro-forged welded grating as well as offering dimensional sketches and data on riveted grating. Also discussed is bridge decking and an illustrated series on the various types of anchors suggested for grating installations. A detailed safe load table with conversion factors, panel width constant chart and data on the standard widths and types of steel stair treads most frequently used are also recorded in the pamphlet. Available at no charge simply by writing directly to the home office: Dept. SP, Klemp Metal Grating Corp., 6601 South Melvina Avenue, Chicago 38, Illinois.

—AE—

TURBO-DOZER—More than 50 photographs arranged in film clip fashion illustrate the operation and correct application of the Michigan Model 180 Turbo-Dozer in a new 20-page booklet offered by Clark Equipment Company's Construction Machinery Division. A running commentary or "script" alongside the photographs describes the operational features of this first rubber-tired dozer powered by a turbo-charged diesel engine. It explains how hydraulic controls facilitate easier maintenance, how the 2¾-yard capacity bowl can be tilted while the machine is in motion and how the machine moves over the highways under its own power, at a speed of 27 miles per hour. Dimensional specifications of the Model 180 are shown on side and overhead view drawings. Engine, power train, and hydraulic system specifications are also listed. Turbo-Dozer Bulletin 157 may be obtained by writing to Clark Equipment Company, Construction Machinery Division, Pipestone Road, P. O. Box 599, Benton Harbor, Mich.

—AE—

AIR CONDITIONING—A comprehensive new 16-page illustrated bulletin on the construction, operation and application of Marlo Seazonaire Remote Room Air Conditioning Units has just been published by Marlo Coil Company. Marlo Seazonaire Air Conditioning provides individually controlled units for use in hotels, motels, institutions, office buildings and other multiple installations. Gives complete information on Seazonaire floor and ceiling type models, free standing and recessed. Bulletin is available without charge from Marlo Coil Company, 6137 Manchester Ave., St. Louis 10, Mo.

—AE—

GLASS FIBER PRODUCTS—A new catalog describes and illustrates uses of Microlite and Super Fine blanket insulations for thermal and acoustical treatments. In addition, it has references to such diverse topics as Microflex compressed board, a resilient cushion material: quartz and glass Micro-Fibers, reinforcements for plastics and yarns for the textile industries. Form WPD-11 is available on request from the L. O. F. Glass Fibers Company, 1810 Madison Avenue, Toledo, Ohio.

AIR VALVES, CYLINDERS—The complete line of Allenair cylinders, valves, clamps and dial feed indexing tables is featured in a new illustrated catalog issued by The A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y. Described are a complete range of valve-in-head, single and double ended cylinders; solenoid, pilot and hand air valves; spring return clamp and 3 different models of dial feed tables. The bulletins, together with price sheets, are spiral bound into a master catalog for easy reference. Request from issuer.

—AE—

TRAFFIC AND TRACTION — General Electric has issued three new bulletins dealing with transportation. GEA-6389, a prescription for curing traffic congestion by the use of rapid transit begins with the cause of today's traffic problems. The 16-page, two-color publication gives a complete discussion of how drivers can be converted into transit riders, what a transit system should consist of, why expressways alone won't solve the problem, how expressways and transit can work together, and how a center mall for rapid transit can multiply an expressway's capacity. Completely illustrated with photographs, a chart, and a drawing, the bulletin is considered to be one of the most comprehensive of its type yet put out by private industry. The second bulletin, GEA-6085 discusses the major components of the G-E traction system. Stressing an integrated system, this two-color bulletin describes a method of assuring better locomotive utilization and easier maintenance. Also discussed are a simply designed G-E traction motor which provides 15 per cent more continuous traction effort, generators which are built to reduce locomotive road failures, and control requiring minimum maintenance between annual inspections. The third bulletin, GEZ-1520, a report on how people feel about the railroad industry, also interprets the effect of a series of G-E advertisements in railroad and a mass medium magazine last year with the objective of informing the public of the progress railroads are making and of their vital part in the U. S. economy. Based on "depth interviews," the report lists both favorable and unfavorable comments about the industry. In summarizing conclusions, actual verbatim quotes of community leaders are given. The three bulletins are available from Apparatus Sales Division, General Electric Co., Schenectady 5, N. Y.

—AE—

V BELTS—A 14-page illustrated manual on V belts has been published by The B. F. Goodrich Company Industrial Products Division, Akron, Ohio, and is available without charge. The manual covers the following topics: designing the new drive; double matching; installation of belts; how V belts grip; importance of tension; drive alignment; how to clean; storage. A V belt service chart, which illustrates typical causes of belt failure, is featured. Full-scale photographs show what belts look like after failure due to any of the following causes: oil deterioration, cover fabric rupture, slip burn, ply separation, ruptured cords, worn belt sides, snub break, distorted belt, abrasion and base cracking. Ways to prevent belt failure are outlined.

What's New

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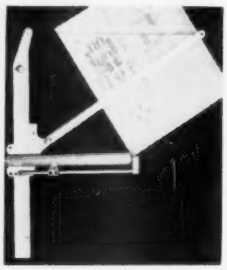
FOR PERSPECTIVE DRAWINGS — Item 1



The PERSPECTOR marketed by Perspectograph Corp. is designed to produce worm's eye as well as bird's eye views and works backward as well as forward. Easily operated by means of a calibrated sweep arm and an abacus chart of curves, it enables the user to translate an orthographic into a perfect perspective, in a matter of minutes, simply by plotting his perspective points and connecting them.

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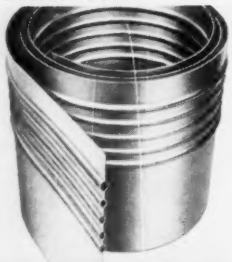
TUBE-IN-STRIP — Item 2



A new mill product in the form of a single strip, or sheet, of *solid* copper, brass or aluminum in which tubes are inflated to desired running lengths in a variety of shapes or sizes was announced by Revere Copper and Brass, Inc. Tube-In-Strip is said to have almost limitless and immediate applications in the heat exchange field, including refrigeration and air conditioning, chemical, food and petroleum processing, automobile radiators, water heaters and coolers, gas heaters, radiant panel heating, and electronics.

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RESIN COATING — Item 3

A labor-saving, low-cost solution to an age-old industrial problem maintaining and upgrading wood, metal, and masonry surfaces is announced by The Glidden Company with the introduction of a new, 100% solids resin coating, named Glid-Iron. Has excellent adhesion to wood, metal and concrete. Is highly resistant to chemicals, thus making it ideal as a floor coating in fruit processing plants, canneries, dairies, plating and chemical plants, and machine shop areas. May be applied by spray, brush, roller or squeegee. Capable of smoothing out and bridging small cracks. Sets to a hard, tough, flexible and scuff resistant finish after curing overnight at normal room temperatures.

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WATER CONDITIONER — Item 4

The Packard Manufacturing Co. announces a new water conditioner that eliminates and prevents scale and corrosion formations in boilers and water systems without the use of chemicals. For use on boilers, air conditioning and refrigerating systems, laundries and other industrial applications where water problems exist: the Packard Water Conditioner is said to prevent scale and corrosion by imparting added energy to the atoms of the water solution. Reduces operating costs. Easily installed. No moving parts. 10-yr. warranty.

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ALUMINUM INSULATION — Item 5

Pre-fabricated multiple aluminum insulation opens up automatically, in one operation, into multiple layers of aluminum, fiber and reflective air spaces. It insulates most efficiently with full, uniform depth protection from joist-to-joist, takes up little storage space, installs easily.

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

STRUCTURAL SECTIONS TEMPLATE — Item 6

A new structural cross sections template, with 43 sharply engraved symbols of I-beams, broadflanged I-beams, channels and angles is announced by A. Lawrence Karp. Can be used with pen, pencil or stylus. The structural cross sections symbols are engraved into .030 rigid vinyl that has been glare proofed with a special matte finish. Available in either 1" or ¾" scale. Catalog showing many other templates available.

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RETURN BEND — Item 7

A new type of return bend has been developed by the Gerry Tool Co. A Female Return Bend to accommodate ¼" to 1" diameter tubes in steps of ⅛" with an optional cup depth of 3/16" to ¼". The center to center distance would be ⅛" greater than the outside tube diameter the return bend accommodates. An extremely tight return bend, it is used to advantage by manufacturers of domestic hot water heating equipment, air conditioning units, refrigeration units, and heat exchangers.

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CAULKING FOR ALUMINUM — Item 8

Sparkling bits of aluminum in the form of microscopic, rolled flakes, are being interlocked with rubber to provide a new caulking compound boasting high durability and a glistening surface. Called Aluminum Rubbertex, the compound is being produced and marketed by Overall Paint and Lead Co., Inc. The producer claims this is the only rubberized caulk now geared, in color and quality, for use with long-lasting aluminum doors, windows and other aluminum building materials. It gives a complete weld-like bond that blocks out moisture, air and sunlight and is said to afford extraordinary expansion and contraction protection.

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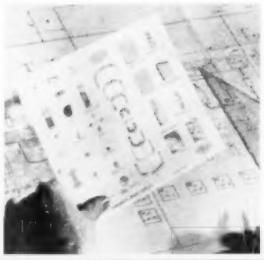
FOR LAYOUT OF GRAPHIC PANELS — Item 9

This drafting aid, called the Panelgraph Layout Template, now available from Panellit, Inc., is a precision template with scaled outlines representing the most frequently used industrial instruments. These representations are scaled accurately at 2" to the foot. Also provided are outlines for pumps, valves and other graphic panel symbols as well as vessels. Fabricated from 20-gage, frosted Lucite.



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BOARD ATTACHMENT PROTECTS DRAWINGS — Item 10

SPIROLL attaches easily to the front edge of any drawing board and enables the draftsman to work on a drawing while seated or while standing. By sliding the drawing down into the device, the bottom section of the sheet is coiled safely out of the way. The sliding action is smooth and trouble-free because there are no moving parts to stick, jam, or wear out. Hinged construction allows easy access to drawers under the board.

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If you feel that you are now, or are capable of becoming, broad enough to undertake engineering responsibilities of this scope, your application is invited and assured of our careful, confidential consideration. We are particularly interested in reviewing applications from men with 1-3 years of general engineering experience.

Please forward complete resume and basic salary requirements to:

Mr. G. Tinker,
Placement Manager

FOSTER WHEELER CORP.
165 Broadway,
New York, N. Y.
Room 720

Letters

(*Continued from page* 61)

comparing the engineer with the doctor of medicine. The doctor was contented although earning far less because he was recognized as a professional while the engineer is just another employee, so the story stated . . . The engineer's ideology of dissatisfaction is caused by the following:

Management: Assigning the graduate engineer to a job that is not worthy of the title of an engineer, such as piece rate setter, piece part planning, machine design, tool design, project analyzing, and labor grading.

Personnel: Painting too attractive a picture of the assignment and his progress with the company. The engineer is firmly convinced after leaving the personnel department on his way to his first assignment that he is going to be president of the company within fifteen years.

University: During his undergraduate days, the embryonic engineer is not acquainted with the types of jobs industry assigns to engineers and what they may expect from these assignments.

Engineer: Security is his main object, not what kind of a job it is, but sick benefits, old age pension, vacations and termination pay.

Unless management, including personnel, and the universities take the necessary steps to impress on the recent graduate what he may expect from industry, the dissatisfaction among engineers is going to lead to a formidable union that will hinder the engineering advancement necessary for these United States to maintain its place in world affairs.

ROY PALMER, P.E.,
Winston-Salem, N. C.

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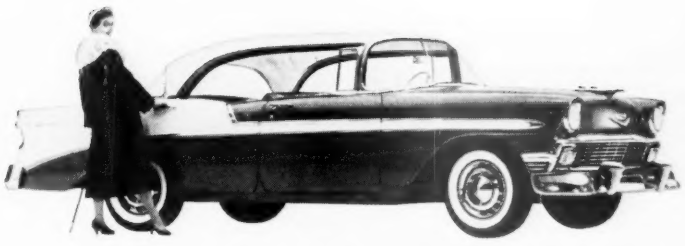
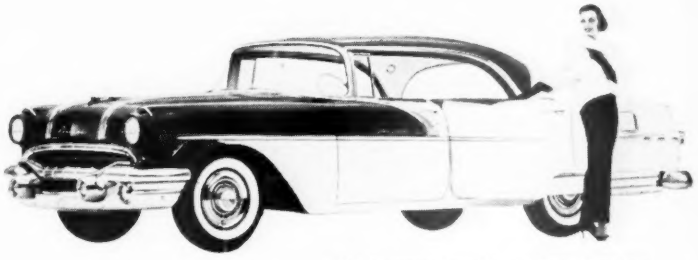
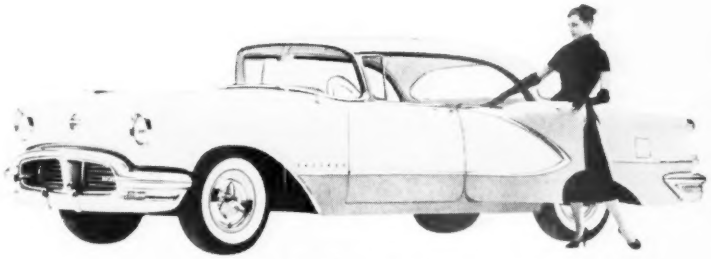


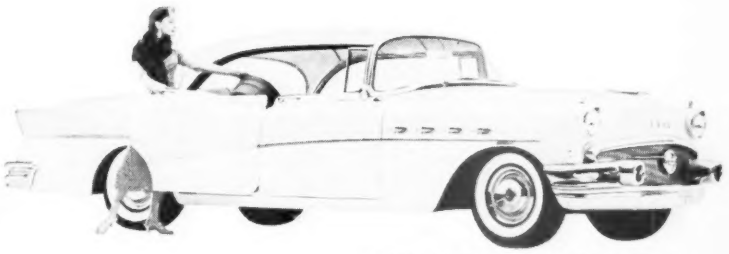
1956 Chevrolet Bel Air 4-Door Sports Sedan



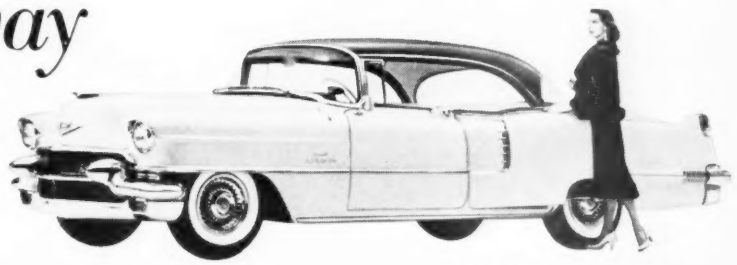
1956 Pontiac Star Chief 4-Door Catalina



1956 Oldsmobile Ninety-Eight DeLuxe Holiday Sedan



1956 Buick Roadmaster 4-Door Riviera



1956 Cadillac Sedan de Ville

THIS NEWEST and most popular of motor fashions is now offered by General Motors in '56 cars of every price class. And their dashing beauty is matched by equally thrilling advances in high-compression power in all five—coupled with even smoother, still more responsive Powerglide, Hydra-Matic and Dynaflow automatic drives. Plus extra-safety improvements like Power Brakes, Power Steering, Unisteel Bodies with double-locking door latches, safety-aim headlights and seat belts (optional) on every GM car. So in 1956, more than ever, your key to greater value is the key to a GM car.

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All with Body by Fisher • GMC TRUCK & COACH

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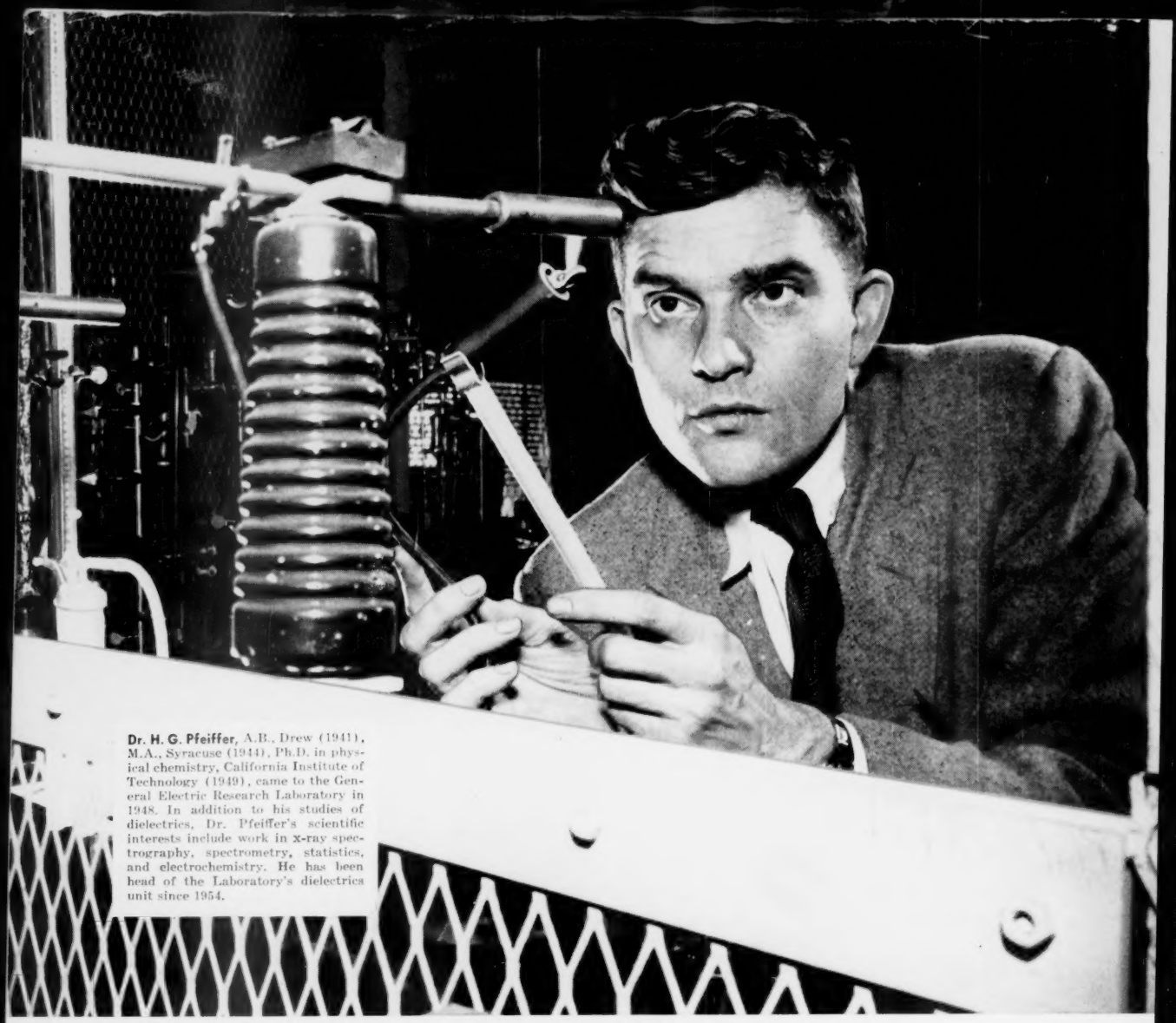

Dr. H. G. Pfeiffer, A.B., Drew (1941), M.A., Syracuse (1944), Ph.D. in physical chemistry, California Institute of Technology (1949), came to the General Electric Research Laboratory in 1948. In addition to his studies of dielectrics, Dr. Pfeiffer's scientific interests include work in x-ray spectrography, spectrometry, statistics, and electrochemistry. He has been head of the Laboratory's dielectrics unit since 1954.

Dielectric research that can lead to improved insulators

Dr. H. G. Pfeiffer leads General Electric study group

Science has found perfect electrical *conductors* (several elements are "superconductors" at temperatures near absolute zero), but the perfect *insulator* has not been achieved — and may not exist. Although theoretical perfection may be unattainable, scientists are convinced that better understanding of "breakdown" and similar phenomena will lead to improved insulating materials for many practical applications. At the General Electric Research Laboratory a group led by Dr. H. G. Pfeiffer is finding significant new fundamental knowledge about the sources of electric strength. For example, their study of liquid insulators has shown why the *area* of electrodes has a substantial effect on transformer-oil breakdowns. Their work also has shown that the sparking potential of simple hydrocarbon gases can be predicted from molecular structure. Now Dr. Pfeiffer and his associates are applying insight gained from studying liquid and gaseous dielectrics to help solve the even more difficult problem of understanding what keeps electrons from moving through solids.

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